

**PROJECT MANUAL
FOR
DEHESA ELEMENTARY SCHOOL
MODERNIZATION OF BUILDINGS
A & B**

**DEHESA
SCHOOL DISTRICT**



**JANUARY 25, 2024
Construction Documents
A# 04-122772**

Prepared by:
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SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

- A. Architect:
Sprotte+Watson Architecture and Planning, Inc.
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Vista, CA 92081
(760) 639-4120
Patricia Sprotte
#C-12359
- B. Civil Engineer
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- D. Plumbing and Mechanical Engineer:
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La Mesa, CA 91941
(619) 466-6224
Cesar Rodriguez
#M33447
- E. Electrical Engineer
Turpin & Rattan Engineers
4719 Palm Avenue
La Mesa, CA 91941
(619) 466-6224
Dale Franchak
#11533



END OF DOCUMENT 00 01 07

SEALS PAGE

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DEHESA SCHOOL MODERNIZATION

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT

APP: 04-122772 INC:

REVIEWED FOR

SS ☒ FLS ☒ ACS ☒

DATE: 03/26/2024

SECTION 01 10 00**SUMMARY****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work by District.
5. Work under separate contracts.
6. District-furnished products.
7. Contractor-furnished, District-installed products.
8. Access to site.
9. Coordination with occupants.
10. Work restrictions.
11. Specification and drawing conventions.
12. Miscellaneous provisions.

- B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of District's facilities.

1.3 PROJECT INFORMATION

- A. Project: Dehesa Elementary School Modernization
- B. Project Description: The Project includes site work and modernization. work in Buildings A and B. The Project includes the modernization and enlarging of the Library in Building A. Additionally Building B is to include the modernization of the Kindergarten Classrooms, Staff Lounge, Computer Room (Green Room), Copy Room and required site accessibility upgrades.
- C. Project Location: Dehesa Elementary School, 4612 Dehesa Road, El Cajon, CA 92019

SUMMARY**01 10 00 - 1****DEHESA SCHOOL MODERNIZATION**

- D. District: Dehesa School District.
4612 Dehesa Road
El Cajon, CA 92019
- E. Architect Identification: The Contract Documents, dated October 23, 2023, were prepared for Project by: Sprotte+Watson Architecture and Planning, Inc. 450 S. Melrose Drive, Ste.200, Vista CA 92081
- F. Commissioning Authority (CxA):

1.4 CONTRACT

- A. The Project will be constructed under a single prime contract.

1.5 PRECONSTRUCTION DOCUMENT PERIOD

- A. The time period of 14 days, starting with the commencement date in the Notice to Proceed, shall be considered the Preconstruction Documentation Period.
 - 1. This time period shall be used for such things a Preconstruction Meeting, submittal deliverables, Schedule of Values, mobilization, and Baseline Schedule.
 - 2. Nothing else shall be performed at this time without written permission from the District.

1.6 PHASED CONSTRUCTION

- A. The Work shall be conducted in one phase.
- B. General: Cooperate fully with District so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by District. Coordinate the Work of this Contract with work performed by District.

1.7 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

1.8 DISTRICT-FURNISHED PRODUCTS

- A. District will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing District-furnished products and making building services connections, start-up, testing, commissioning, and demonstration.
 - 1. Refrigerator

SUMMARY**01 10 00 - 2****DEHESA SCHOOL MODERNIZATION**

2. Dishwasher
3. Microwave

- B. Provide District Construction Manager 15 days' prior notice of requirements for delivery to site of all District furnished products. Notify District in writing within 7 days of receiving District furnished products of acceptance or rejection of products furnished. District Construction Manager, after receiving notice, will take appropriate action to have District furnished products made acceptable for Contractor's use. Carefully store and protect from damage rejected District furnished products until District takes appropriate action.

1.9 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by District's right to perform work or to retain other contractors on portions of Project.
- B. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- C. Use of Site: Limit use of Project site to areas within the Contract limits] indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Limits: Confine construction operations to areas where work is permitted.
 2. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to District, District's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- D. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- E. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.10 COORDINATION WITH OCCUPANTS

- A. Full District Occupancy: District will occupy site and adjacent building(s) during entire construction period. Cooperate with District during construction operations to minimize

SUMMARY

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DEHESA SCHOOL MODERNIZATION

conflicts and facilitate District usage. Perform the Work so as not to interfere with District's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from District and approval of authorities having jurisdiction.
2. Notify District not less than [72] seventy-two hours in advance of activities that will affect District's operations.

B. Partial District Occupancy: District will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with District during construction operations to minimize conflicts and facilitate District usage. Perform the Work so as not to interfere with District's operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from District and authorities having jurisdiction.
2. Provide not less than [72] seventy-two hours' notice to District of activities that will affect District's operations.

C. District Limited Occupancy of Completed Areas of Construction: District reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Partial Completion for each specific portion of the Work to be occupied prior to District acceptance of the completed Work.
2. Before limited District occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, District will operate and maintain mechanical and electrical systems serving occupied portions of Work.
3. On occupancy, District will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.11 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to hours indicated in General Conditions modified by the Supplementary Conditions. Exceptions to these hours include utility shutdowns and noisy activity.

SUMMARY

01 10 00 - 4

DEHESA SCHOOL MODERNIZATION

- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by District or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify District not less than seven days in advance of proposed utility interruptions.
 - 2. Obtain District's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate with District operations that may result in high levels of noise and vibration, odors, or other disruption to District occupancy or neighboring properties.
 - 1. Notify District not less than seven days in advance of proposed disruptive operations.
 - 2. Obtain District's written permission before proceeding with disruptive operations.
- E. Controlled Substances: Use of tobacco products and other controlled substances on District property is not permitted.
- F. Work may be performed from March through end of August 2024.

1.12 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

SUMMARY

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DEHESA SCHOOL MODERNIZATION

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

**SECTION 01 21 00
ALLOWANCES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Related Requirements:
 - 1. Section 02 82 33 Removal and Disposal of Asbestos Containing Materials
 - 2. Section 02 83 33 Removal and Disposal of Material Containing Lead
 - 3. Section 02 84 33 Removal and Disposal of Universal Waste and PCB

1.3 DEFINITIONS

- A. Allowance is a quantity of work or dollar amount established in lieu of additional requirements, used to perform services or defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order (CO).

1.4 ACTION SUBMITTALS

- A. Submit proposals for purchase of products, systems, or services included in allowances, in the form specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

1.6 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 ALLOWANCES

- A. Use allowance only as directed by District for District's purposes and only by APRs that indicate amounts to be charged to the allowance.
- B. Allowance includes cost of materials, equipment, delivery, receiving, handling, labor, installation, warranty, and insurance. Contractor's supervision, overhead, profit and bond costs to be determined at time of use.
- C. At Project closeout, credit unused amounts remaining in the allowance to District by Change Order.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION**

3.1 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: For **Unforeseen work to Exterior Walls**, as directed by District. Include Unforeseen Conditions allowance of \$ 25,000.
- B. Allowance No. 2: For **Asbestos related work**, as directed by District. Include Hazardous Materials allowance of \$ 35,000.
- C. Allowance No. 2: **For Unforeseen work to existing MEP Systems**, as directed by District. Include Unforeseen Conditions allowance of \$ 13,500.

END OF SECTION 01 21 00

**SECTION 01 25 00
SUBSTITUTION PROCEDURES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 01 21 00 "Allowances" for products selected under an allowance.
 - 2. Section 01 23 00 "Alternates" for products selected under an alternate.
 - 3. Divisions 02 through 33 Sections for specific product and manufacturer requirements and for limitations on substitutions.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor. Substitutions include "or equal" products.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use form provided at the end of this Section.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by District and

- separate contractors that will be necessary to accommodate proposed substitution.
- c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and Districts.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within [7] seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within [15] days of receipt of request, or [7] seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS**2.1 SUBSTITUTIONS**

- A. Submit requests for substitution not later than [35] days after the Notice to Proceed.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)**END OF SECTION 01 25 00**

REQUEST FOR SUBSTITUTION

Re: _____
 Section # _____ Project Name _____

 Date _____ Item _____
 To: _____
 Architect _____
 From: _____
 General Contractor _____

We hereby submit for your consideration the following product comparisons of the specified item and the proposed substitution:

A.	Comparison	<u>Specified Item</u>	<u>Substitution</u>
1.	Product Name/Model	_____	_____
2.	Manufacturer	_____	_____
	Address	_____	_____
	Phone Number	_____	_____
3.	Product Cost	_____	_____
	Installation/Labor Cost	_____	_____
4.	Delivery Time	_____	_____
	Installation Time	_____	_____
5.	Product Characteristics	_____	_____
		_____	_____
		_____	_____
		_____	_____
6.	Dimensions	_____	_____
	Effects	_____	_____
7.	Guarantee/Warranty	_____	_____
8.	CBC-ES No.	_____	_____
9.	UL Rating	_____	_____

B. Substantiating Data: Attach manufacturer's literature for both specified item and substitution.

C. Samples: Provide samples for both specified item and substitution.

D. Similar Projects

1. _____
Name _____ Date _____

Address _____
2. _____
Name _____ Date _____

Address _____

E. Maintenance Service/Parts:

Name: _____

Address: _____

What effect does this substitution have on applicable code requirements?

G. Changes to Drawings and Specifications:

Attach information completely describing changes to be made to drawings and specifications.

- Contractor hereby certifies equal performance and assumes of liability for equal performance.
- Contractor hereby agrees to pay for all costs involved with changing the building design, including engineering, drafting, specifications editing, coordination, and preparation of detailed cost estimates, caused by the proposed substitution.

Submitted by:

Signature

Printed Name

Title

Company

Date

Address

Address

Telephone _____

Email _____

Signature must be by person having authority to legally bind Contractor to the above terms. Failure to provide legally binding signature will result in retraction of approval.

For Use by District's Representative:

District's Design Consultant Date: _____ <input type="checkbox"/> Accepted <input type="checkbox"/> Not Accepted By (print): _____ Title: _____ Signature: _____	School District Date: _____ <input type="checkbox"/> Accepted <input type="checkbox"/> Not Accepted By (print): _____ Title: _____ Signature: _____
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SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including the following:
 - 1. Document Control Software.
 - 2. General coordination procedures.
 - 3. Administrative and supervisory personnel.
 - 4. Coordination drawings.
 - 5. RFIs.
 - 6. Project meetings.
- B. Related Requirements:
 - 1. Section 01 32 01 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 01 39 00 "Project Forms" for applicable project forms.
 - 3. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 4. Section 01 74 19 "Construction Waste Management and Disposal" for procedures for managing construction waste materials.
 - 5. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.
 - 6. Section 01 91 13 "General Commissioning Requirements" for coordinating the Work with District's Commissioning Authority.

1.3 DEFINITIONS

- A. RFI: Request for Information. Request from Contractor seeking information required by or clarifications of the Contract Documents.
- B.

1.4 INFORMATIONAL SUBMITTALS

- A. Key Personnel Names: Within ten (10) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
1. Post copies of list in project meeting room, in temporary field office, in web-based Project software directory, in prominent location in each built facility, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for District and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities, including those of the District and separate contractors, to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Pre-installation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.

- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as District's property.
 2. Coordinate management and recycling of solid waste generated from construction activities. Refer to Section 01 74 19 "Construction Waste Management and Disposal" for tracking, management and recycling requirements for construction activities related waste.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - e. Indicate required installation sequences.
 - f. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.

2. Plenum Space: Indicate subframing for support of ceiling[, **raised access floor**,] and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
9. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 00 "Submittal Procedures."

1.7 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, prepare and submit an RFI using the District's Document Control Software. Immediately notify the District Construction Manager, Project Inspector, District Project Manager, Architect, and Document Controls Specialist of all RFIs submitted.

1. Architect will return RFIs submitted by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. RFI number, numbered sequentially (for revised RFIs, keep the original RFI number, but add an R1, R2, etc. as a suffix.)
 3. Date of RFI Question.
 4. Name of Contractor, as well as name of individual from Contractor submitting the RFI.
 5. Name of Architect.
 6. RFI subject.
 7. Detailed description of item needing information or interpretation.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution, if any. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: See Section 01 39 00 "Project Forms" for RFI form. This form will be generated electronically by the Document Control Software from the Contractor's input data.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow five (5) working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day. Incomplete RFIs or inaccurately prepared RFIs will be returned without action.
1. RFIs will be returned without action if they are used for any purpose other than a request for information. Such uses include:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.

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- f. Requests for interpretation of Architect's actions on submittals.
- 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
- E. RFI Log: The Document Control Software will generate an RFI Log. The Log will be brought to each weekly Project meeting by the District Construction Manager.

1.8 PROJECT MEETINGS

- A. General: Attend all project meetings. District Construction Manager will schedule and conduct meetings and conferences at Project site unless otherwise indicated.
 - 1. Attendees: District Construction Manager will inform participants and others involved, and individuals whose presence is required, of date and time of each meeting.
 - 2. Minutes: District Construction Manager will record meeting results.
- B. Preconstruction Conference: District Construction Manager will schedule a preconstruction conference before starting construction, at a time convenient to District, but no later than fourteen (14) days after execution of the Notice to Proceed.
 - 1. District Construction Manager will conduct the conference to review responsibilities and personnel assignments.
 - 2. Attendees: Authorized representatives of District, District's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect progress. Include the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Commissioning requirements and procedures.
 - m. Indoor environmental air quality management during construction.
 - n. Preparation of record documents.
 - o. Use of the premises and existing building.

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- p. Work restrictions.
 - q. Working hours.
 - r. District's occupancy requirements.
 - s. Responsibility for temporary facilities and controls.
 - t. Procedures for moisture and mold control.
 - u. Procedures for disruptions and shutdowns.
 - v. Construction waste management and recycling.
 - w. Parking availability.
 - x. Office, work, and storage areas.
 - y. Equipment deliveries and priorities.
 - z. First aid.
 - aa. Security.
 - bb. Progress cleaning.
 - cc. Request for Substitution procedures.
 - dd. Use of District's Document Control Software for RFIs.
4. District Construction Manager will record meeting results and distribute them to all parties in attendance within two (2) days of meeting.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Project Inspector of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Submittals
 - c. Options.
 - d. Related RFIs.
 - e. Related Change Orders.
 - f. Purchases.
 - g. Deliveries.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.

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- u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 - z. Commissioning requirements and procedures.
 - aa. Indoor environmental air quality management during construction.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: District Construction Manager will schedule and conduct a project closeout conference, at a time convenient to District and Architect, but no later than thirty (30) days prior to the scheduled date of Substantial Completion.
- 1. Conference will be conducted to review requirements and responsibilities related to Project closeout.
 - 2. Attendees: Authorized representatives of District, District's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect or delay Project closeout including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing operations and maintenance data.
 - e. Requirements for delivery of additional stock and spare parts.
 - f. Requirements for demonstration and training.
 - g. Commissioning requirements and procedures.
 - h. Indoor environmental air quality requirements prior to occupancy.
 - i. Preparation of Contractor's punch list.
 - j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - k. Submittal procedures.
 - l. The District's partial occupancy requirements.
 - m. Installation of the District's furniture, fixtures, and equipment.
 - n. Responsibility for removing temporary facilities and controls.
 - 4. Minutes: District Construction Manager will record meeting results and distribute to all parties in attendance within two (2) days of meeting.

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- E. Progress Meetings: District Construction Manager will conduct Project Progress Meetings at weekly intervals. Project Progress Meetings are in addition to specific meetings held for other purposes, such as Schedule Review Meetings.
1. Attendees: In addition to representatives of District and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: District Construction Manager will review minutes of previous progress meeting. District Construction Manager will review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Schedule Updating: Revise Look-Ahead Schedule prior to each Progress Meeting. Send (by Email) the revised Look-Ahead Schedule to the District Construction Manager no later than 24 hours before the next Progress Meeting. The Look-Ahead Schedule shall be submitted in PDF electronic file format using computer software acceptable to District Construction Manager.
 - b. Review present and future needs of each entity present including:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) Status of RFIs.
 - 15) Status of proposal requests.
 - 16) Pending changes.
 - 17) Status of Change Orders.
 - 18) Documentation of information for payment requests.
 3. Minutes: District Construction Manager will record meeting results and distribute to all parties in attendance within two (2) days of the meeting.
- F. Monthly Schedule Review Meetings: See Section 01 32 01 "Construction Progress Documentation."

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

**SECTION 01 31 10
CONTRACTOR PERSONNEL**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes Contractor personnel to be assigned to this Project.
- B. Related Requirements:
 - 1. Section 01 31 00 "Project Management and Coordination" for project management procedures.
 - 2. Section 01 32 01 "Construction Progress Documentation" for scheduler requirements.

1.3 KEY CONTRACTOR PERSONNEL

- A. Contractor shall assign the following minimum personnel to the project:
 - 1. Contractor Construction Manager: Part time on-site.
 - 2. Contractor Construction Superintendent: Full Time on-site.
 - 3. Contractor Assistant Construction Project Manager: Full time on-site

1.4 REQUIREMENTS FOR KEY PERSONNEL

- A. Contractor Construction Manager shall have a minimum of **10** Ten years experience as Construction Manager or Superintendent on projects of similar size and scope.
- B. Contractor Construction Superintendent shall have a minimum of **10** Ten years experience as Construction Superintendent on projects of similar size and scope.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 10

SECTION 01 32 01
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Daily construction reports.
- B. Related Requirements:
 - 1. Section 01 10 00 "Summary" for phased construction and Preconstruction Document Period.
 - 2. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
 - 3. Section 01 40 01 "Quality Requirements, District Laboratory" and Section 01 40 02 "Quality Requirements, Contractor Laboratory" for submitting schedules of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity whose delay would result in the delay to overall duration.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
 - 4. Milestone Activity: An activity that does not occupy time or resources, but highlights an event.
- B. Activity Codes: Values assigned to schedule activities to organize the schedule into groups for reporting and analysis. Examples include Responsibility, Building, and Site Area.

- C. Calendar: Defines the week for different activities within the CPM schedule. Examples of calendars include 5-day week minus holidays, 7-day week, and 6-day week. Different calendar types may be used in the CPM schedule.
- D. Constraint: In the CPM schedule, a constraint is used to affect the float, duration, or date of an activity.
- E. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships.
 - 1. CPM Network: A sequence of inner-connected activities. Network calculations determine the critical path and when activities can be performed.
- F. Critical Path: The network of schedule activities that establishes the minimum overall Project duration.
- G. Data Date: The date used as the starting point for schedule calculations. For baseline CPM schedules, the Data Date is the first date of the schedule where an activity occurs. For monthly updates, the Data Date is the first workday after the monthly cutoffs as decided by the District Construction Manager.
- H. Day: A calendar day, unless otherwise specifically defined. Where “Day” is inherently differently defined, such as in schedules prepared using Microsoft Project, convert days to account for specified calendar days.
- I. Delay: An interruption of work. See the General Conditions.
- J. Milestone: The starting or ending point of an activity or linked series of activities. A milestone in the schedule contains zero duration.
 - 1. Key Milestone: A major milestone. A key milestone includes the following: Notice to Proceed, Substantial Completion, Phase Start Date, and Phase Finish Date. Add additional Key Milestones as directed by District Construction Manager.
 - 2. Contractual Milestone: A milestone tied to Liquidated Damages. Substantial Completion is both a Key and Contractual Milestone.
- K. Float: The measure of leeway in starting and completing an activity.
 - 1. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 2. Total float is the amount of time by which a part of the Work may be delayed from its early dates before it delays a succeeding activity.
 - 3. Contract Float: The amount of time between the Contractor’s anticipated dates for early completion of the Work, or specified part, and the corresponding Contract Time.
 - 4. Ownership of Float: Total float and contract float belong to the project and are not for the exclusive benefit of any party. Total float and contract float are jointly owned, and are expiring resources available to the District or the Contractor on a

first-come-first-served-basis to accommodate changes in the Work, or to mitigate the effects of float for the benefit of the project. Monitor float to determine if any float erosion is for the benefit of the project.

5. Float Manipulation: Utilizing unrealistic or inflated durations, imposed dates, artificial logic and/or lags, preferential logic, date constraints, and others that results in an impact to Float. Do not manipulate float. Add detail within the schedule in order to mitigate the use of Float manipulation. Provide a detailed written explanation in the Baseline Narrative for items seen as potential float manipulation if directed by District Construction Manager. After a review of the Baseline Schedule and the detailed written explanation, any such actions ultimately seen as Float manipulation by the District Construction Manager may result in direction for a Baseline revision and re-submittal.

- L. Lag: A relationship delay between CPM schedule activities.
- M. Near-Critical Activity: A non-critical activity with a Total Float value within 10 workdays of the Critical Path.
- N. Percent Complete: The portion of an activity that is complete based on the measurement of work accomplished. Percent completes are ultimately decided by the District Construction Manager.
- O. Relationships: Ties between activities within the CPM schedule.
- P. Target Schedule: A different version of the CPM schedule that can be used as a basis for comparison against another CPM schedule.
- Q. TIA: Time Impact Analysis.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 1. PDF electronic file(s).
 2. Electronic software file (for all CPM schedule submittals). Provide a unique file name in the schedule software for all CPM Schedules.
 3. Two paper copies of all required reports and charts unless directed otherwise by the District Construction Manager.
 4. All hardcopies shall be signed and stamped by the Contractor's Project Manager.
 5. Transmittal.
- B. Contractor's Construction Schedule:
 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (baseline, monthly update, time impact analysis, etc.) and submittal date on label.

- C. Reports: As part of every CPM schedule submittal, submit each of the following reports:
1. Detailed Gantt-chart: Individual columns on left shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, calendar identifier, total float, predecessors and successors. Activities shall be grouped in a manner acceptable to the District Construction Manager. All activities shall be depicted, and activities shall be sorted by early start dates, then total float and early finish dates. Gantt-chart shall be on a page of sufficient width required to display entire schedule for Contract Time. Size of paper/sheet is at discretion of District Construction Manager, and sheet size shall be either 8.5" x 11" or 11" x 17". Gantt-chart shall depict relationship lines between activities and shall also clearly show the critical path.
 - a. Columns on monthly updates shall also include: current month's percent complete.
 2. Schedule Narrative Report: With every CPM schedule submittal, submit a schedule narrative. The narrative report shall contain the following:
 - a. Baseline Schedule: Sufficiently detailed explanations of assumptions in baseline schedule development including:
 - 1) General work sequencing, including phasing and interim housing considerations.
 - 2) Justification of the critical path.
 - 3) Long lead equipment or material items.
 - 4) Constraints and challenges to completing the work.
 - 5) Coordination assumptions, both with subcontractors (e.g. coordination drawings, Building Information Modeling, etc.) and other parties (e.g., District, Architect/Engineer, School Site Staff, Utility entities, etc.)
 - 6) Work week schedule, work hours and non-working days, including holidays, work time constraints such as limitations to academic calendar breaks, after-school hours, etc.
 - 7) Person(s) preparing and providing input towards schedule submittal.
 - b. Monthly Update: Items in this narrative report shall include:
 - 1) Physical progress accomplished during the report period, broken down by each building and site area (e.g. parking lot, play field, second floor, etc.).
 - 2) Explanation of Critical Path if changed from previous month's update (or accepted Baseline, if first Monthly Schedule Update).
 - 3) Explanation of potential delays and/or problems and their estimated impact, Key and/or Contractual Milestones.
 - 4) All Notices of Delay that have been submitted to the District Construction Manager.

- 5) Alternatives for possible schedule recovery to mitigate delay or potential delay.
 - 6) Known or anticipated problems with delivery of materials or equipment.
 - 7) Approved weather/weather impact dates incurred in previous month, along with affected CPM schedule activity identification numbers and activity descriptions.
 - c. Other variations of the above reports, as directed by the District Construction Manager.
- D. Daily Construction Reports: Submit to District Architect at weekly intervals.

1.5 QUALITY ASSURANCE

- A. Scheduler Qualifications: An experienced specialist in CPM scheduling who is capable of satisfying the requirements described herein. The Scheduler is to provide planning, evaluation, reporting and delay analysis using CPM scheduling.
- B. Schedule Software: All CPM schedules shall be prepared with a Windows operating system based CPM scheduling computer software program capable of satisfying all the requirements herein, and is subject to the review and acceptance by the District Construction Manager.

1.6 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, BASELINE

- A. Baseline Schedule: Prepare and submit a baseline CPM schedule that shows the breakdown of all work into activities to the extent required to effectively plan the project, report work progress, analyze time impacts and show all logical relationships (ties) between activities. The Contract CPM Schedule shall be the basis for monitoring the Contractor's progress against milestone dates and Contract Time, and the evaluation and reconciliation of extensions in Contract Time. The Baseline Schedule shall communicate and constitute the Contractor's detailed intent for planning

and executing the work. Construct the Baseline Schedule based on the Contract Documents, including any addenda received during the bid phase. The District will assume the Contractor has coordinated with all subcontractors when developing the Baseline Schedule.

1. Breakout of Work Into Multiple Schedules: Even if multiple school sites or DSA numbers are attributed to a Contract, multiple schedules that break out work by school site, DSA number, etc., are not allowed.
2. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion as defined in the General Conditions.
 - a. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
 - b. Early Completion: If the District Construction Manager accepts an early completion schedule and the District Construction Manager does not revise the Contract completion date as defined in the General Conditions, the Baseline must first include a float activity that fills the time between the early completion and the contractual substantial completion date. The Contractor agrees to forego any extended overhead between early completion noted in the Baseline and the contractual substantial completion date.
3. Activities in the Baseline Schedule shall comply with the following:
 - a. Activity Duration: Estimate the amount of time to start and complete each activity. Define field work activities so no activity is longer than 15 workdays, unless specifically allowed by District Construction Manager.
 - b. Units of Time: Workdays shall be the default unit of time for an activity in the schedule. Indicate nonworking days and holidays incorporated into the schedule in order to correlate with Contract Time.
 - c. Critical Path: Critical Path is to be easily identifiable. Any part of the Baseline Schedule's Critical Path deemed unreasonable by the District Construction Manager may result in direction for a Baseline Schedule revision and re-submittal.
 - d. Percentage of Critical and Near-Critical Activities: Plan the Work and provide for and allocate resources in the execution of the Work so that the proportion of incomplete schedule activities with total float of 20 workdays or less within the Critical path shall not exceed 33 percent of all incomplete schedule activities, unless acceptance for a greater proportion is granted by the District Construction Manager.
 - e. Procurement Cycle Activities: Include procurement process activities as separate activities in the schedule. Procurement cycle activities include submittals, submittal reviews and approvals, purchasing, fabrication, and delivery.
 - f. Submittal Review Time: Include review times indicated in Section 01 33 00 "Submittal Procedures" in Baseline Schedule.
 - g. Relationships and CPM Network: CPM networks shall be closed, whereby every activity shall have, at a minimum, one predecessor and one

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- successor relationship. The exceptions to this closed network rule are the network's start and finish milestones.
- h. Constraints: Constraints shall be scrutinized and shall only be used to reflect contractually and/or environmentally imposed conditions. Add schedule activities and detail to mitigate the use of Constraints. Constraints are not permitted where an activity or logical relationship is appropriate, unless specifically accepted by the District Construction Manager.
 - i. Lags: Lags shall be scrutinized. Add schedule activities and detail to mitigate the use of Lags. Lags of less than -1 are not permitted, unless specifically accepted by the District Construction Manager.
 - j. Schedule Settings: The setting in the CPM scheduling software shall be set so that the logic is retained when calculating the schedule. Critical activities shall be defined as Longest Path. The "progress override" option shall not be utilized, unless directed otherwise by the District Construction Manager. Autocost, Resource, and Schedule calculation rules shall be set to the default settings.
 - k. Activity Detail: Field work activities shall not reflect a combining of work located in separate buildings or site areas, work corresponding to different Specifications Sections, work performed by different Subcontractors, or rough and finish work of the same trade. The CPM Schedule shall include activities and appropriate time for temporary items (e.g. scaffolding and concrete formwork), curing, testing, items that interface with work performed by others (e.g. Owner Furnished Owner Installed items), regulatory agency approvals, permitting, City of San Diego and utility activities, physical checkout, startup, mobilization, operational and maintenance manual preparation, equipment and systems training, cleanup, and contractor's internal punch list.
 - l. Activity Descriptions: Descriptions for schedule activities shall provide adequate detail that defines the activity, scope and location.
 - m. Activity Coding: Activities shall be mapped so they are grouped in a manner acceptable to the District Construction Manager.
 - n. Milestones: Include Key Milestones indicated in the Contract Documents in Schedule.
 - o. Negative Float: The Baseline Schedule shall not contain negative float.
 - p. Weather: The Baseline Schedule shall include, during the period from the start of mobilization (or start of field work activity, whichever starts first) through the date of Substantial Completion, workdays for anticipated weather delays affecting the critical path.
 - 1) The weather allowance shall be depicted as one separate activity in the CPM Schedule as the final activity prior to the Substantial Completion milestone, and shall be on the critical path with no concurrent activities.
 - a) Include weather days as an allowance in the CPM schedule per the following table:

Weather Table

	Month											
Anticipated Weather Days	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	7	5	7	2	1	1	0	0	1	2	3	5

- b) If the Contract Time starts or ends in the middle of a month, the weather allowance shall be prorated. For example, if mobilization starts on February 1 and Substantial Completion is November 20 of the same year, the weather allowance is 20 workdays.
- 2) Unused weather allowance days become jointly owned float.
 - 3) If the number of approved weather days in a month exceed the number depicted in the Weather Table, or if the grand total of approved weather days exceed the number allotted in the contract, the number of weather days in excess are excusable and non-compensable.
 - 4) Weather or the results of weather on non-scheduled workdays will not be considered. Reference documents shall include CPM schedules and Look Ahead schedules to determine scheduled workdays.
 - 5) If the Contractor considers weather or the results of weather as an impact to the critical path and/or a Contractual Milestone, the Contractor has two workdays from the date in question to provide written justification for the weather day request, describing the Primavera activity/activities impacted, as well as describing how over 50 percent of the Critical Path work for the requested day was impacted. Describe work done to mitigate weather impact.
 - 6) The District Construction Manager determines if a weather day has been incurred, and the Critical Path and/or Contractual Milestone so affected. If the Contractor does not provide written justification regarding weather impacts, the District Construction Manager can still determine if weather days have been incurred.
 - 7) If weather impacts a Contractual Milestone for a phase that is not on the critical path, the Contractor shall receive excusable and non-compensable relief equal to the number of days impacted by weather.
- B. Work Restrictions: Include any work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Work by District: Include a separate activity for each portion of the Work performed by District, including Owner Furnished Contractor Installed (OFCI) and Owner Furnished Owner Installed (OFOI) items.
 2. District-Furnished Products: Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.
 3. Work Restrictions: Show the effect of the following items on the schedule:

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- a. Coordination with any existing construction.
 - b. Limitations of continued occupancies.
 - c. Partial occupancy before Substantial Completion.
 - d. Use of premises and any site-specific restrictions.
- C. Baseline Schedule: Submittal, Review and Acceptance. Within the timeline specified below (Schedule Table 1), the Contractor shall submit the Baseline Schedule to the District Construction Manager for review and acceptance.

Schedule Table 1

Description	Calendar Days for Individual Item	Cumulative Cal- endar Days
Contract Time Start Date, per Notice to Proceed	0	0
Contractor submits complete Baseline Schedule submittal to District Construction Manager for review	21	21
District Architect presents review comments (and possible ac- ceptance) to Contractor (Meet- ing may be required, at District Construction Manager's discre- tion)	7	28

1. The deduction for Contractor's delayed submission of the complete Baseline Schedule submittal is \$150 per day. This deduction also applies to resubmittals.
2. Upon submittal by the Contractor, the District Architect will review the Baseline Schedule and provide comments within the timeframe shown in Schedule Table 1. The District Architect has the ability to question any aspect of the Baseline Schedule submittal. If the District Architect raises questions or identifies schedule deficiencies or noncompliance with the Contract Documents, a revision and re-submittal is required. The Contractor shall make appropriate adjustments or corrections and shall deliver to the District and District Architect the Baseline Schedule re-submittal within 7 days of receipt of the District Architect's comments. Indicate in writing the adjustments or corrections made by the Contractor, including individual responses to every comment made by the District Construction Manager on the previous submittal. The District Architect will review and return written comments on the re-submitted Baseline Schedule within 7 days of receipt of the Contractor's re-submittal. The above process shall be repeated until the District Architect provides written notification to the Contractor that the Baseline Schedule has been accepted.

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- a. The District may withhold 10 percent of each progress payment until such time that the Contractor submits and the District Architect accepts the Baseline Schedule submittal. The District Construction Manager may also stop the Work in accordance with the General Conditions if the Baseline Schedule has not been accepted. Delays here shall be deemed inexcusable.
3. Upon acceptance of the Baseline Schedule, all activities and their relationships shown on the Baseline Schedule may not be changed, added, or deleted without the consent of the District. The Contractor may not alter activity identification numbers, or rename activities without the District's written consent.
4. The initial accepted Baseline Schedule is a schedule that shall reflect no progress on schedule activities.
5. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of District Architect's acceptance of the schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within [30] thirty days of date established for the Notice to Proceed. Base schedule on the startup construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in [10] Ten percent increments within time bar.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, MONTHLY SCHEDULE UPDATES

- A. Contractor's Construction Schedule Updating: At monthly intervals update the schedule to reflect actual progress and forecast the remainder of the work. Submit the Monthly Schedule Update to the District who will either accept it, accept it with notes, or direct the Contractor to revise and resubmit. On the last workday of each month or other day determined by District, submit a draft schedule update for review. The Data Date shall be the 1st day of the month. For example, if the monthly update is to capture all work accomplished in April the Data Date shall be May 1st. the Draft Monthly Schedule Update shall consist of the following:
 1. A hardcopy print out of the Detailed Gantt-chart distributed to the District and Architect. Sheets for this item are to be no larger than 11" x 17".

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2. A markup of the hardcopy print out showing percent completes, actual start dates and actual finish dates to indicate work accomplished during the month. Also indicate the expected finish dates or remaining duration for activities that have started but have not yet completed; remaining duration shall be the Contractor's best estimate of the time required to complete activities.
- B. Monthly Schedule Review Meeting: Within three (3) days of the Draft Monthly Schedule Update submittal, the Contractor shall meet with District Architect to finalize the Monthly Schedule Update, as well as discuss required corrections and proposed revisions to the schedule.
1. After the meeting, make any needed adjustments to the Schedule and Schedule of Values as directed by the District, make final entries in the schedule software, recalculate the schedule, and submit the final Monthly Schedule Update submittal. The Monthly Schedule Update submittal, including Progress Payment submittal items, is due no later than three (3) days following the Monthly Schedule Review Meeting.
- C. Monthly Schedule Update:
1. Requirements: The Monthly Schedule Update shall not be used to delete activities, add activities, make title changes, make activity coding changes, or to make logic changes.
 2. Distribution: Distribute copies of schedule update to District Project Manager. Also submit compact disc containing files of reports/charts described in Section 1.4.C, as well as electronic backup file of schedule. The Contractor must submit the Monthly Schedule Update package to the District Project Manager before the District will process an Application for Progress Payment for each month.
 3. Other activities in Schedule: The only activities to be added to the Monthly Schedule Updates are the following:
 - a. Approved Time Impact Analysis.
 - b. Approved Weather Dates (one Activity per approved Weather Date).
 - 1) The original duration for the weather allowance activity shall be reduced each month by the number of approved weather days, only up to the number of weather days per month per the Weather Table. For example, if there are 5 approved weather days in May, the original duration shall still only be reduced by 1.
 - c. Procurement Cycle re-submittals (i.e., Specification re-submittal after rejection, Specification re-submittal review.
 4. Review: The District Project Manager, upon review, will either accept, accept with comments, or reject the Monthly Schedule Update submittal. Allow seven (7) days for the District Project Manager's review of the Monthly Schedule Update package.

- a. Completeness of Submittal: The District may withhold up to 5 percent of the pre-retention progress payment if, in the District Manager's opinion, the Contractor has failed to meet the Monthly Schedule Update submittal requirements.
- b. Acceptance of the Monthly Schedule Update submittal by the District Project Manager shall be a condition precedent to the processing of the subsequent Progress Payment.

3.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, SCHEDULE CORRECTION

- A. Each month, the Contractor shall address corrections to the schedule that were identified by the District Project Manager during the review of the last Monthly Schedule Update. These corrections generally include correction of inaccurate or missing actual dates, correction of logic for activities being driven by the data date, incorrect percent complete, and out of sequence progress. The District Project Manager may require the Contractor to adjust, add to, or clarify any portion of the schedule that he/she may consider insufficient to monitor the work. No additional compensation will be provided for such adjustments, additions, or clarifications.
- B. If the Monthly Schedule Update submittal is rejected, the Contractor must individually respond to every correction and review comment received from the District Project Manager in the re-submittal of the Monthly Schedule Update package.
- C. If the submittal is conditionally accepted with noted exceptions, the Contractor shall respond to every correction and review comment via the schedule narrative of the next Monthly Schedule Update submittal. Failure of the Contractor to specifically respond to each of the District Project Manager's previous review comments may result in rejection of the following submittal.

3.3 CONTRACTOR'S CONSTRUCTION SCHEDULE, LOOK AHEAD SCHEDULES

- A. Look Ahead Schedule: Prepare and submit a report indicating activities performed in the one week prior and two weeks following the day of week as determined by the District Construction Manager. Due to the District Construction Manager in electronic format no later than 24 hours before the start of each weekly progress meeting, the Look Ahead Schedule shall include the following:
 - 1. Columns on left hand side of report, indicating the following:
 - a. Activity number, corresponding to the same field in the CPM schedule.
 - 1) Potential or approved change orders shall be included as activities with temporary activity identification numbers until such time that change orders are approved and incorporated into the CPM schedule.
 - b. Activity description.

- c. Responsibility.
 - d. Average estimated crew size during this time.
- 2. Dates on the right hand section of report, with marks noting the specific dates that activity was performed / will be performed for each of the look ahead activities.
 - 3. Generated in a CPM schedule software application or Microsoft Excel.
 - 4. Details shall include material and equipment deliveries, non-work days such as holidays, and approved weather days.
 - 5. Other information or formatting, at the discretion of the District Construction Manager.

3.4 CONTRACTOR'S DAILY REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events relating to this Contract:

- 1. List of subcontractors at Project site.
- 2. List of separate contractors at Project site.
- 3. Count of personnel and hours worked at Project site by trade.
- 4. Visitor(s) to the Project site.
- 5. Major Equipment at Project site.
- 6. Material deliveries.
- 7. Work activities performed at Project site, including CPM schedule activity identification numbers.
- 8. High and low temperatures and general weather conditions, including any precipitation totals.
- 9. Site Conditions.
- 10. Request for weather day, include CPM schedule activity identification number(s) and activity description(s) affected.
- 11. Action(s) taken to prepare for anticipated upcoming weather event.
- 12. Accidents and near-accidents.
- 13. Meetings and significant decisions.
- 14. Issues incurred or addressed.
- 15. Unusual events.
- 16. Stoppages, delays, shortages, and losses.
- 17. Meter readings and similar recordings.
- 18. Emergency procedures.
- 19. Orders and requests of authorities having jurisdiction.
- 20. Change Orders received and implemented.
- 21. Change Directives, Field Work Orders, or Architect's Supplemental Instructions received and implemented.
- 22. Services connected and disconnected.
- 23. Equipment or system tests and startups.
- 24. Partial completions and occupancies.
- 25. Substantial Completions authorized.

- B. Daily Reports are to be prepared in such a way that all text is Optical Character Recognition (OCR) searchable. Hand-written text is not acceptable.
- C. Upon receipt, the District Project Manager will review each Daily Report. If needed, corrections to Daily Reports may be required.
- D. Starting with the first day of construction activity or any activity on site, submit a separate and distinct Daily Report for each day. Daily Reports for the previous week are due no later than Monday of the following week. For example, the Daily Reports for Monday April 1st through Friday April 5th are due to the District Construction Manager no later than Monday April 8th.

3.5 CONTRACTOR'S CONSTRUCTION SCHEDULE, RECOVERY SCHEDULE

- A. In the event that the progress of the Work or the sequencing of the activities of the Work differs from that indicated in the Baseline Schedule or previous Monthly Update Schedules, the District Project Manager may direct the Contractor to submit a Recovery Schedule. Prepare and submit a Recovery Schedule if the current monthly schedule update depicts a late Substantial Completion forecast, or as otherwise deemed appropriate by the District Project Manager.
 - 1. Within ten (10) days of the District Project Manager's direction, prepare and submit a Recovery Schedule to the District Construction Manager demonstrating the Contractor's plan to recover lost time. The District Construction Manager will review the Recovery Schedule and provide documented comments within seven (7) days. Appropriate recovery actions include assignments of additional labor or equipment, shift or overtime work, expediting of submittals or deliveries, overlapping of activities, or sequencing changes to increase activity concurrence. The accompanying narrative shall describe the cause of the problems and the actions planned by the Contractor to recover the schedule.
- B. If the delay necessitating the Recovery Schedule is caused by the Contractor, all costs for recovery shall be borne by the Contractor.

3.6 CONTRACTOR'S CONSTRUCTION SCHEDULE, SCHEDULE REVISION

- A. Schedule Revisions are defined as any changes to schedule activities or logic other than the updating of actual start and completion dates, percent complete or remaining duration.
- B. Revise the Baseline Schedule when the District Project Manager determines that it is no longer useful as a status and control mechanism, when a change or delay impacts the Contractor's timing and sequence of the work, or when the Contractor has submitted logic changes that affect critical or near-critical activities as determined by the District Construction Manager.

1. If directed by the District Project Manager, prepare and submit within ten (10) days the Schedule Revision submittal for review and acceptance. Provide a separate narrative, the electronic data file from the CPM schedule software, and a Detailed Gantt Chart for each proposed revision showing the revised activities and how the Contractor proposes to tie them into the accepted CPM Schedule. The District Project Manager will provide comments to the Contractor within seven (7) days of receipt. After the District Project Manager accepts the specific activities and logic changes proposed in the schedule revision, promptly incorporate the revision into the next Monthly Schedule Update.

3.7 CONTRACTOR'S CONSTRUCTION SCHEDULE, TIME IMPACT ANALYSIS

- A. Time Impact Analyses shall demonstrate the impacts of the delay to the critical path, and shall be completed in one of two ways:
 1. Prospective Time Impact Analysis (Forward Looking):
 - a. Submit a Prospective Time Impact Analysis (TIA) within fourteen (14) days of receiving a written request for a TIA from the District Project Manager for an issue that has yet to complete.
 2. Retrospective Time Impact Analysis (Backward Looking):
 - a. If the Contractor experienced what he/she considers to be an excusable delay to the critical path, submit a Retrospective Time Impact Analysis within fourteen (14) days of the completion of the delay event.
 - b. All efforts shall be made to rectify such TIAs as contemporaneously as possible.
 3. Notes:
 - a. The Time Impact Analysis submittal shall consist of a CPM schedule sub-network (fragnet) derived by adding activities and relationships representing the delay into the last accepted Monthly Schedule Update prior to the start of the delay event (or the accepted Baseline, if event occurs before first Monthly Schedule Update).
 - b. If the Contractor does not submit a Time Impact Analysis request within the timeframes noted above, the Contractor shall be deemed to have voluntarily irrevocably waived any rights to additional time and cost.
 - c. If the District Project Manager determines that the accepted schedule used as the basis for the Time Impact Analysis does not appropriately represent the conditions prior to the event, meet with the District Project Manager and Architect to jointly update the schedule to the day before the start of the event being analyzed.
- B. Multiple issues are not to be combined into a single Time Impact Analysis submittal.
- C. Include the following items with all Time Impact Analysis Request submittals:

1. A fragnet where impacts to the critical path can be clearly viewed, with distinct activities for each component of the Time Impact Analysis, breaking out activities by Responsible party (Contractor, Architect/Engineer, District, etc.), trade (Mechanical contractor, Concrete contractor, etc.), and site area (e.g., parking lot, second floor staff restroom, library, etc.).
 2. A written narrative that notes the following:
 - a. The number of days requested.
 - b. A detailed description on the cause and effect of delay.
 - c. A detailed description of the Contractor's daily activities relating to the delay on each day during the delay period, as well as a description of the Contractor's diligence in mitigating the delay.
 - d. A list of additions, deletions and/or changes to activities and logic.
 - e. For Retrospective Time Impact Analyses, the Contractor needs to address gains and losses to activities impacting the critical path during the period(s) in question.
 3. All supporting backup documentation (e.g., Requests for Information, Field Work Orders, Correspondence, etc.).
 4. An electronic copy of the CPM schedule application file(s) used for the TIA.
- D. Allow ten (10) days after receipt of the Time Impact Analysis submittal for the District Construction Manager to accept or reject the request.
- E. The Contractor shall not incorporate any part of the Time Impact Analysis into the Monthly Schedule Update until the associated Change Order has been approved.
- F. If a Time Impact Analysis submitted by the Contractor is rejected by the District Project Manager, request a Meet and Confer with the District within fourteen (14) days of rejection to discuss and resolve issues related to the request. If agreement is not reached, the Contractor will be allowed ten (10) days from the meeting with the District to give notice in strict conformity with the applicable provisions of the General Conditions.
- G. Where the District Project Manager has not rendered formal decision on the Contractor's Time Impact Analysis for adjustment of Contract Time, and the parties are unable to agree as to amount of adjustment to be reflected in the CPM Schedule, reflect that amount of time adjustment in the CPM Schedule as the District Project Manager may accept as appropriate for the interim. It is understood and agreed that such interim acceptance by the District Project Manager will not be binding and will be made only for purpose of continuing to schedule work, until such time as a formal decision as to an adjustment, if any, of the Contract Time acceptable to the District Project Manager has been rendered.
- H. The Contractor shall be responsible for all costs associated with the preparation of the Time Impact Analysis for inexcusable or concurrent delays. For critical path delays approved as excusable by the District, the Contractor will be paid a flat fee of \$300.00 per Time Impact Analysis submittal, to be invoiced as a separate Change Order after

incorporation into the accepted CPM schedule. A Time Impact Analysis request without merit will not be approved, and hence, not reimbursed.

3.8 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: In addition to what is specified herein, comply with procedures contained in The Associated General Contractors of America's "Construction Planning & Scheduling Manual".
- B. Timely submissions of the schedules described in this Section are of significant importance, and lack of or late receipt diminishes their value to the Project.

END OF SECTION 01 32 01

SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
- B. Related Requirements:
 - 1. Section 01 33 00 "Submittal Procedures" for submitting photographic documentation.

1.3 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Include same information as corresponding photographic documentation.
- B. Color Digital Photographs: Submit image files within three days of taking photographs.
 - 1. Digital Camera: Minimum sensor resolution of 8 megapixels.
 - 2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
 - 3. Identification: Provide the following information with each image description in file metadata tag:
 - a. Name of Project.
 - b. Name of Contractor.
 - c. Date photograph was taken.
 - d. Description of location, vantage point, and direction (by compass point), and elevation or story of construction.
 - e. Unique sequential identifier keyed to accompanying key plan.

- C. Video Recording: At the Contractor's option, provide video recording in lieu of photographs specified in paragraph, "Preconstruction Photographs." Submit one copy in digital video disc format acceptable to District.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name of Contractor.
 - c. Date videotape was recorded.

1.4 USAGE RIGHTS

- A. If a professional photographer is engaged to take photographs or video recordings, obtain and transfer copyright usage rights from photographer to District for unlimited reproduction of photographic documentation.

1.5 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in both RAW and JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.
- B. Digital Video Recordings: Provide high-resolution, digital video disc in format acceptable to District.

1.6 PHOTOGRAPHS

- A. General: Take color photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in file name for each image.
- C. Preconstruction Photographs: Before commencement of demolition, take photographs that show preconstruction conditions of existing landscape materials; on-site paving; building interior finishes to include ceilings, walls and floors; and interior and exterior equipment that are to remain in place.

1. The photographs will be used to determine responsibility for damage that might appear to have been caused by construction activities. It will be the Contractor's responsibility, through photographs, to show that damage was pre-existing.

1.7 VIDEO RECORDINGS

- A. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
 1. Confirm date and time at beginning and end of recording.
 2. Begin each video recording with name of Project, Contractor's name, and Project location.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION (Not Used)****END OF SECTION 01 32 33**

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 01 31 00 "Project Management and Coordination" for use of District's Document Control Software.
 - 2. Section **01 32 01** "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 3. Section 01 40 02 "Quality Requirements / Contractor Laboratory" for submitting quality control schedules and reports.
 - 4. Section 01 77 00 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
 - 5. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 6. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 7. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of District's personnel.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect or District and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with Baseline Schedule.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL FORMATS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Execute a data licensing agreement in form acceptable to District and Architect. See attached agreement.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal timing of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, District, or other parties is indicated, allow 21 days for initial review of each submittal.
 5. DSA review: Where submittal must be reviewed by DSA, allow 35 days for review of submittal.
- D. Options: Identify options requiring selection by Architect. Make all submittals electronically..
- E. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations.
- F. Electronic Submittals: Provide submittals immediately notify Architect, District Project Manager, and Project Inspector, of all submittals made.
- G. Paper Submittals: Provide paper submittal only where required by individual specification sections. Place a permanent label or title block on each submittal item for identification.
1. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling.

2. Provide a space approximately [6 by 8 inches] <Insert dimensions> on permanent label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information:
 - a. Project name.
 - b. Date.
 - c. Transmittal Destination (To:).
 - d. Transmittal Source (From:).
 - e. Name of Architect.
 - f. Name of District Construction Manager.
 - g. Name of Contractor.
 - h. Name of firm or entity that prepared the submittal.
 - i. Names of subcontractor, manufacturer, and supplier.
 - j. Unique submittal number, including revision identifier. Include Specification Section number with sequential identifier; and alphanumeric suffix for resubmittals.
 - k. Number and title of appropriate Specification Section.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Other necessary identification.
 - o. Remarks.
 4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
- H. Resubmittals: Make resubmittals in same manner as initial submittal.
1. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
 2. For paper submittals, note date and content of previous submittal.]
 3. [For paper submittals, note date and content of revision in label or title block and clearly indicate extent of revision.]
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Furnish one copy of each final action submittal marked with approval notation from Architect's action stamp to Project Inspector.
- K. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.6 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Post electronic submittals as PDF electronic files directly to Document Control Software.
 - a. Architect will post annotated file and notify Contractor of posting.
 - 2. Action Submittals: For paper submittals, submit four paper copies of each submittal for District use and as many copies as Contractor wants returned for Contractor use.
 - 3. Informational Submittals: For paper submittals, submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
 - 4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Provide certificates and certifications signed by an officer or other individual authorized to sign documents on behalf of that entity.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 - 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted].
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Prepare Shop Drawings on same digital data software program, version, and operating system as original Drawings
 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 3. Provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

- a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as District's property, are the property of Contractor.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit two full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one submittal with options selected.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
 5. Submit product schedule in the following format:
 - a. PDF electronic file.

- F. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- G. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- H. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- I. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- J. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- K. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- L. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- M. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- N. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- O. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

- P. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- Q. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- R. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of applicable codes and regulations, and calculations, list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

1.7 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit **digitally signed PDF electronic file and [3]** three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C. BIM Incorporation: Incorporate delegated-design drawing and data files into Building Information Model established for Project.
 - 1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.

1.8 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - 1. Architect will not review submittals that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and post review on Document Control Software. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
 - 1. No Exceptions Taken
 - 2. Revise and Resubmit
 - 3. Make Corrections Noted
 - 4. Rejected
 - 5. Incomplete or Insufficient Information for Review.
 - 6. Resubmittal Not Required
- B. Informational Submittals: Architect will review each submittal and will post submittal review on Document Control Software only if it does not comply with requirements.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals received from sources other than Contractor will be returned by the Architect without action or may be discarded.
- F. Submittals not required by the Contract Documents will be returned by the Architect without action or may be discarded.

SPECIFICATIONS

NO. 22-0400

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 33 00

**SECTION 01 39 00
PROJECT FORMS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes standardized forms to be used for this project. Examples of forms used in District's document control software are provided at the end of this Section.
- B. Listing of project forms:
 - 1. Application for Payment, Periodic Payment and Continuation Sheet (Forms G702 and G703).
 - 2. Change Order (CO)
 - 3. Allowance Payment Record (APR).
 - 4. Field Work Order (FWO).
 - 5. Schedule of Values (SOV).
 - 6. Architect's Supplemental Instructions (ASI).
 - 7. Request for Information (RFI).
 - 8. Submittal Register.
 - 9. Inspection Request.
 - 10. Notice of Deviations (DSA Form 154; for DSA Projects only).
 - 11. Notice of Non-Compliance
 - 12. Request for Proposal (RFP).
 - 13. Submittal Transmittal
 - 14. Shop Drawing/Submittal Transmittal
 - 15. Request for Electronic Files

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

3.1 FORMS

- A. Forms follow in Section 01 39 00.01

END OF SECTION 01 39 00

**SECTION 01 39 00.01
PROJECT FORMS**

APPLICATION AND CERTIFICATE FOR PAYMENT (G702)

TO:

PROJECT: NORTHWOOD E.S. CLASSROOM BUILDING (APPLICATION NO: _____)

DISTRIBUTION TO:

<input type="checkbox"/>	OWNER
<input type="checkbox"/>	ARCHITECT
<input type="checkbox"/>	CONTRACTOR
<input type="checkbox"/>	FIELD
<input type="checkbox"/>	OTHER

PHONE:

VIA ARCHITECT: _____

Sprotte+Watson Architecture and Planning

PHONE: 760.639.4120

PERIOD TO:

PROJECT NO:

CONTRACT DATE:

CONTRACT FOR:

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM	\$
2. Net Change by Change Orders & Extras	\$
3. CONTRACT SUM TO DATE	\$
(Line 1 + Line 2)	
4. TOTAL COMPLETED & STORED TO DATE	\$
(Column G on G703)	

5. RETAINAGE:

- a. ____ % of Completed Work ...\$ _____
b. ____ % of Stored Material\$ _____
Total Retainage (Line 5a + 5b)

6. TOTAL EARNED LESS RETAINAGE	\$
(Line 4 less Line 5 Total)	
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT	\$
(Line 6 from prior Certificate)	
8. CURRENT PAYMENT DUE	\$
9. BALANCE TO FINISH, INCLUDING RETAINAGE	\$
(Line 3 less Line 6)	

CHANGE ORDER SUMMARY

Total changes approved in	
Previous months by Owner	\$
Total approved this month	\$
NET CHANGES by Change Order	\$

State of: _____ County of: _____
Subscribed and sworn to before me this _____ day of _____, 20____
Notary Public: _____ My Commission Expires: _____

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

INSPECTOR:

By: _____ Date: _____

OWNER:

By: _____ Date: _____

AMOUNT CERTIFIED\$ _____

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

CHANGE ORDER

OWNER ☐
ARCHITECT ☐
CONTRACTOR ☐
FIELD ☐
OTHER ☐

PROJECT:

CONTINGENCY CHANGE ORDER #:

CONTRACTOR:

CHANGE ORDER DATE:

(name, address)

ARCHITECT'S PROJECT #:

CONTRACTOR'S CONTRACT #:

CONTRACT DATE:

DSA APPLICATION #:

DSA FILE #:

Directions to Contractor: You are not to proceed with modifications to the contract documents described herein until authorized by the District. The price for this change order is full and complete compensation for any and all; (1) overhead incurred as a result of performing said changes; (2) delays in the completion of the project incurred as a result of performing said changes; (3) all equipment, materials, labor, field and home office overhead, indirect and direct consequential costs, mark-ups and profit necessary to complete the work. By executing this contract change order, the contractor agrees to proceed with this work as a change order per the general and supplemental conditions of the contract and waives any rights to additional compensation arising out of the work listed in this change order, including without limitation, any claims relating to any cumulative effects of change orders, delays, productivity, impact, or interruption.

CHANGE ORDER SUMMARY:

I have reviewed the figures submitted by the General Contractor and they have been reviewed and accepted by the School District. I believe this request is valid and recommend your approval for acceptance.

Not valid until signed by the Owner, Architect and Contractor

The original GMP Sum was:	0.00	
Net change by previously authorized by Contingency Change Orders:	\$0.00	
The GMP Sum prior to this Contingency Change Order was:	0.00	
The Contract Sum will be (changed/unchanged) by this Contingency Change Order in the amount of:	\$0.00	
The new Contract Sum including this Change Order will be:	0.00	
The Contract Time will be (unchanged) by:	0 Days	
The date of Substantial Completion as of the date of this Change Order therefore is:	No Change from Original Date	
Architect	CONTRACTOR	OWNER
ADDRESS:		
BY: _____	BY: _____	BY: _____
Date: _____	Date: _____	Date: _____

ALLOWANCE PAYMENT RECORD

Dehesa School District - 4612 Dehesa Road, El Cajon, CA 92019-2922

Project:
Title:
To:

APR No.:
Date:
Contract No.:

Directions to Contractor

Please submit an itemized quotation for the allowable charges to be paid from the project allowance. If payment is for reimbursement of fees paid, attach copies of all invoices and cancelled checks.

Description of Fees Paid or Work Performed

Justification

Allowance Title:	Scheduled Value	\$0.00
	Pending APRs	\$0.00
	Prev. Paid Applications	\$0.00
	This APR	\$0.00
	Balance	\$0.00

Actions

Contractor Signature	_____	Date: _____
Architect Review	_____	Date: _____
Const. Mgr. Review	_____	Date: _____
Inspector Review	_____	Date: _____
Project Manager Review	_____	Date: _____
Issued by	_____	
Director, Const. Mgmt. Dept.	_____	Date: _____

FIELD WORK ORDER

Dehesa School District - 4612 Dehesa Road, El Cajon, CA 92019-2922

Project:
Title:

Field Work Order #:
Date:

To:

Contract #:
Inspector:
Req'd Start Date:

Directions to Contractor

This work is to be done on a documented time and material basis. Document all time, materials and equipment to the Project Inspector on a daily basis. Maintain a complete record of inspector signed daily documents for all costs for doing the work. The inspector signed documentation is required to be included in the CO that will follow. Notify the construction manager when you have reached 80% to 85% of the not to exceed figure below. Within fifteen (15) days the contractor is to furnish to the DISTRICT a detailed Price and/or time proposal in accordance with the contract documents. Upon receipt of this Field Work Order, the contractor shall promptly commence and proceed diligently with this work.

Description of Work to be Performed

Not to Exceed: \$0.00

Justification

Construction Manager: _____

Date: _____

Director, Construction Management: _____

Date: _____

Copy To: Architect, Project Manager, Project Inspector and Construction Office

SCHEDULE OF VALUES

Dehesa School District - 4612 Dehesa Road, El Cajon, CA 92019-2922

PROJECT:

CONTRACTOR:

ADDRESS:

PHONE:

PEOPLESOFT PO#:

APPLICATION NO.:

APPLICATION DATE:

PERIOD TO:

CONTRACT NO:

[illegible]

ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS

Dehesa School District - 4612 Dehesa Road, El Cajon, CA 92019-2922

Title:

Project:

From:

To:

Attn:

ASI No.:

Date:

Contract No.:

DIRECTIONS TO CONTRACTOR

REMARKS

Signed:

Architect:

Date:

Signed:

Contractor:

Date:

Copy To: Construction Manager, Project Inspector, Project Manager

uuu_36:DV_ASI

REQUEST FOR INFORMATION

Dehesa School District - 4612 Dehesa Road, El Cajon, CA 92019-2922

Project:
Title:
Contract No.
From:
To:
Plan Ref:

Document:
Sub Ref. No.:
Date:
Required Date:
Response Date:

Question:

Proposed Solution:

Answer:

Dehesa School District - 4612 Dehesa Road, El Cajon, CA 92019-2922

SPROTTE + WATSON ARCHITECTURE AND PLANNING
450 South Melrose Drive, Suite 200, Vista CA 92081-6664
(760) 639-4120

INSPECTION REQUEST

Dehesa School District - 4612 Dehesa Road, El Cajon, CA 92019-2922

DATE:

PROJECT:
INSPECTOR:
INSPECTION BY:

TITLE:
CONTRACT #:
VENDOR:
REFERENCE DSA #:
INSPECTION NEEDED BY:
REFERENCE SPEC SECTION #:

OTHER DOCUMENTS AFFECTING THIS PORTION OF WORK (ASI, RFI, CCD, etc)

INSPECTION TYPE REQUESTED:

INSPECTOR NOTES:

RESULTS

PASSED?

RE-INSPECTION REQUIRED?

Certified By:

Date:

SPROTTE + WATSON ARCHITECTURE AND PLANNING
450 South Melrose Drive, Suite 200, Vista CA 92081-6664
(760) 639-4120

NOTICE OF NON-COMPLIANCE

Dehesa School District - 4612 Dehesa Road, El Cajon, CA 92019-2922

PROJECT:

DATE:

INSPECTOR NAME:

INSPECTOR CONTACT INFORMATION (PHONE #, E-MAIL ADDRESS):

NON-COMPLIANCE NUMBER:

GENERAL CONTRACTOR:

SUPERINTENDENT:

NATURE OF NON-COMPLIANCE:

PLAN REF.:

SPEC. REF.:

CODE REF.:

REMARKS:

INSPECTOR'S SIGNATURE: _____

CONTRACTOR'S RESPONSE: _____

DATE CORRECTIVE ACTION COMPLETED: _____

ARCHITECT'S APPROVAL OF CORRECTION: _____ (if necessary)

INSPECTOR'S APPROVAL OF CORRECTION: _____ (required)

ADDITIONAL COMMENTS: _____

C: Architect, Construction Manager, Document Control



This form shall be completed by the Project Inspector, in accordance with California Code of Regulations, Title 24, Part 1, Section 4-342(b)(6). The Project Inspector shall provide a copy to the contractor, the architect/engineer and DSA.

DSA 154 (rev 05-01-16) Page 1 of 1
 DIVISION OF THE STATE ARCHITECT DEPARTMENT OF GENERAL SERVICES STATE OF CALIFORNIA

REQUEST FOR PROPOSAL

Dehesa School District - 4612 Dehesa Road, El Cajon, CA 92019-2922

Title:

Date:

Project:

Job:

To:

Contract No:

Directions to Contractor

Please submit and attach an itemized quotation within 15 calendar days for changes in the contract sum and/or time incidental to proceed with modifications to the contract documents described herein. You are not to proceed with the work until authorized by SDUSD. The submitted price for this Change Order is to be full and complete compensation to the contractor for performance of the change described below, and includes, but is not limited to compensation for any and all: (1) overhead incurred as a result of performing said changes; and (2) delays in the completion of the project incurred as a result of performing said changes.

Description of Change

By: _____ Date: _____

SUBMITTAL TRANSMITTAL

JOB #:
PROJECT NAME:
OWNER:
DSA # /FILE #:
CONTRACTOR:
SUBCONTRACTOR :
SPEC. SECTION(S):
DESCRIPTION:

This transmittal record shall be utilized by all personnel to route Submittals through the process. Personnel may provide an additional transmittal, but this form should also be completed to assist in the tracking of the submittal. Keep this transmittal with the submittal. Provide the initials or name of the person to whom the material is being delivered within appropriate boxes below and the quantities of items being sent.

TRANSMITTAL RECORD	ATTN.	DATE SENT	SENT VIA	DATE REC'D	QUANTITY					REV'D BY
					SEPIA	PRINT	MFG. LT.	SAMPLE	OTHER	
Contractor to Architect	Joe Kelly									
REVIEW PROCESS Architect to: <input type="checkbox"/> Civil <input type="checkbox"/> Landscape <input type="checkbox"/> Structural <input type="checkbox"/> Mechanical <input type="checkbox"/> Electrical <input type="checkbox"/> Plumbing <input type="checkbox"/> Acoustical AV <input type="checkbox"/> Owner <input type="checkbox"/> Other										
Consultant to Architect:										
DISTRIBUTION Architect to Contractor:										
Architect to Owner:										
Architect to Inspector:										
Architect										

QTY.	REFERENCE	DATE	DESCRIPTION
	See Above	See Above	

REMARKS:

SHOP DRAWINGS / SUBMITTAL TRANSMITTAL LETTER

School:	Specification Section:
Project:	Submittal No.:
District:	Submittal Description:
DSA Application No.:	Date:

Contractor:	Subcontractor:
Address:	Address:
Phone No.:	Phone No.:
Contact:	Contact:

FIRM NAME

Address

Phone No.

SUBMITTAL HISTORY

ARCHITECT/ENGINEER'S SHOP DRAWING STAMP

REMARKS:

DATE:
PROJECT/JOB:
FILES TRANSMITTED TO:

DESCRIPTION OF FILES TRANSMITTED:

COST: \$XXX.XX Minimum charge of \$150/sheet, payable to Sprotte + Watson prior to release of any electronic files.

DRAWINGS: ☐ AutoCAD files Architectural

Contractor has requested that Architect furnish AutoCAD files in order for its own personnel, subcontractors and other consultants to expedite their work in the creation of shop drawings and/or to aid in the implementation of the Contract, as required per the Contract. *Contractor recognizes that AutoCAD files are not intended to be used for construction, are not Contract Documents under the terms of the Construction Contract, and may be revised by others without the knowledge or consent of the Architect or, when plotted, may result in variances. Further, these drawings are not 100% complete nor approved for construction. There may be some design changes in the final approved drawing documents.*

The Architect is nevertheless willing to provide AutoCAD files on the terms and conditions specified herein.

Architect will only release electronic files of plan sheets and building sections - no exceptions. Contractor requests for electronic files of consultants documents (other than Sprotte + Watson) must contact that consultant directly and comply with that consultant's electronic file release protocol.

Contractor acknowledges that the AutoCAD files are the property of the Architect and subject to the copyright of the Architect. The AutoCAD files are being transmitted to the Contractor for the express purpose as defined above for fulfilling the contractor's requirements for this project; no other use of the AutoCAD files is implied or allowed. Electronic media disks may be write-protected by Architect such that no data on such disk can be manipulated. The Contractor shall have all indices of the Architect's ownership, professional name, and/or involvement in the Project removed from all drawings created for the Contractor's use. Any use of any kind and/or changes to the AutoCAD files will be used at the user's sole risk, and without liability, risk or legal exposure to the Architect or the Project Owner. The Contractor and any other person or entity using the AutoCAD files agrees to release and, to the fullest extent permitted by law, defend, indemnify, and hold harmless the Architect and the Project Owner and its consultants and their partners, shareholders, agents and employees from and against any and all claims demands, losses, expenses, damages, penalties and liabilities of any kind, including without limitation, attorneys' fees arising out of or relating in any way to any such use of or change to the AutoCAD files.

Contractor agrees, as a condition of forwarding the AutoCAD files to its subcontractor or any other consultant, person or entity, that the terms and conditions of this Agreement Concerning Use of Electronic Media shall extend to such third party.

AGREED/CONTRACTOR:

Signed: _____
Print Name/Title: _____
Date: _____

Please sign one copy and return. A scanned file of signed copy via email is acceptable.

XXXXXXXX XXXXXXXX, AIA
Project Architect, Sprotte + Watson Architecture and Planning

SECTION 01 40 01
QUALITY REQUIREMENTS, DISTRICT LABORATORY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control related to tests and inspections performed by District's Testing Agency.
- B. Testing and inspection services specified in this Section will be performed by a Testing Agency selected and employed by the District.
- C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that include those activities. Requirements in those Sections also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by other Sections are not limited by provisions of this Section.
- D. Related Requirements:
 - 1. Section 01 40 02 "Quality Requirements / Contractor Laboratory."
 - 2. Section 01 73 00 "Execution."

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the

Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by District.

- C. Testing Agency: For this Section, an entity engaged by the District to perform specific tests, inspections, or both.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, District will comply with the most stringent requirement.
- B. Minimum Quantity or Quality Levels: Provide or perform quantity or quality level shown or specified. Comply exactly with the minimum quantity or quality specified, or exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements.

1.5 INFORMATIONAL SUBMITTALS

- A. Schedule of Tests and Inspections: District will prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Number of tests and inspections required.
 - 4. Time schedule or time span for tests and inspections.
 - 5. Requirements for obtaining samples.

1.6 QUALITY ASSURANCE

- A. Testing and inspections required by governing authorities will be performed by an independent testing laboratory selected and employed by the District and approved by the Division of the State Architect (DSA). Qualification of a testing agency or laboratory will be under the jurisdiction of the DSA Office of Regulations (ORS) Structural Safety Section (SSS) when applicable. Procedural and acceptance criteria are set forth in CBC Section 1701A, and California Code of Regulations (CBC) Title 24 Part 1, Administrative Code, and the DSA Interpretation of Regulations.
- B. Testing and inspection services which are performed will be in accordance with requirements of CBC Title 24 Part 1, Administrative Code, and as specified herein.
- C. When specified, testing and inspections not required by governing authorities (NON-DSA) will also be performed by an independent Testing Agency selected and employed by the District.

- D. Testing and inspection services will verify that work meets the requirements of the Contract Documents.
- E. In general, tests and inspections for structural materials include all items enumerated on the Statement of Structural Tests and Special Inspections (DSA Form 103) for this project as prepared and distributed by the Architect.
- F. Testing Agency will submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, District Construction Manager, and Project Inspector, with copy to Contractor. Testing Agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 1. Testing Agency will notify Architect, District Construction Manager, Project Inspector and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 2. Testing Agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect, District Construction Manager, and Project Inspector, with copy to Contractor and to authorities having jurisdiction.
 - 3. Testing Agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 4. Testing Agency will retest and reinspect corrected work.
 - 5. Testing Agency will not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 - 6. Testing Agency will not perform any duties of the Contractor.
- G. Test reports will include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Samples taken, but not tested will also be reported. Records of special sampling operations as required will be reported. The reports will show that the material or materials were sampled and tested in accordance with the requirements of CBC Title 24 Part 1 Administrative Code, Part 2 California Building Code, and with the DSA approved specifications. They will also state definitely whether or not the material or materials tested comply with requirements.
- H. Reporting Test Failures:
 - 1. Immediately upon Testing Agency determination of a test failure, the Agency will notify Contractor and other interested parties.

1.7 PAYMENTS

- A. Costs of initial testing and inspection, except as specifically modified herein, or specified otherwise in technical sections, will be paid by the District. Initial tests and inspections are defined as the first tests and inspections as herein specified.

- B. In the event a test or inspection indicates failure of a material or procedure to meet requirements of Contract Documents, costs for retesting and additional work related to failure will be paid by the District and backcharged to the Contractor.
- C. Additional tests and inspections, not herein specified, but requested by District, will be paid by District unless results of such tests and inspections are found to be not in compliance with Contract Documents, in which case the District will pay all costs for initial testing as well as retesting, reinspection and additional work related to non-compliance. District will then backcharge the Contractor for these costs.
- D. Costs for additional tests or inspections required because Contractor changed materials or changed source or supply will be paid by District and backcharged to the Contractor.
- E. Costs for tests or inspections that are required to correct deficiencies will be paid by the District and backcharged to the Contractor.
- F. Extra Testing Agency expenses resulting from a failure to notify the Testing Agency will be paid by the District and backcharged to the Contractor.
- G. Charges due to insufficient advance notice of cancellations or time extension will be paid for by the District and backcharged to the Contractor.
- H. Cost of testing that is required solely for the convenience of Contractor in his scheduling and performance of work will be paid by the District and backcharged to the Contractor.
- I. Overtime costs for testing and inspections performed outside the regular work day hours, including weekends and holidays, due to fault of Contractor will be paid for by the District and backcharged to the Contractor. Such costs include overtime costs for District personnel.
- J. Should it be considered necessary or advisable by the District at any time before final acceptance of the entire work to make an examination of work already completed by removing or tearing out the completed work, promptly furnish necessary facilities, labor and materials on request. If such work is found to be defective in any respect due to fault of the Contractor or his subcontractor, pay for all expenses of such examinations and of satisfactory reconstruction at no additional cost to the District. If, however, such work is found to meet the requirements of the Contract, District will reimburse to the Contractor additional cost of labor and material necessarily involved in the examination and replacement.

1.8 QUALITY CONTROL

- A. Contractor Responsibilities:
 - 1. Notify District Construction Manager and Testing Agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 2. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor and the Contract Sum will be adjusted by Change Order.
- B. Contractor Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify Testing Agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field-curing of test samples.
 5. Preliminary design mix proposed for use for material mixes that require control by Testing Agency.
 6. Security and protection for samples and for testing and inspecting equipment at Project site.
 7. Selection of the material required to be tested will be by the Testing Agency or the District and not by the Contractor.
- C. Notify the Testing Agency a minimum of 3 working days in advance of the manufacture of material to be supplied by Contractor under the Contract Documents, which must by terms of the Contract be tested. Agency will arrange for the testing of such material at the source of supply.
 1. Do not incorporate into the Project any material shipped by the Contractor from the source of supply before having satisfactorily passed such testing and inspection, or before the receipt of notice from the District that such testing and inspection will not be required.
- D. Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.9 PROJECT INSPECTOR

- A. An Inspector employed by the District in accordance with the requirements of CBC Title 24 Part 1 Administrative Code will be assigned to the work. Inspector's duties are specifically defined in CBC Title 24 Part 1, Sec. 4-342.
- B. Notify the Inspector a minimum of two working days in advance of execution of all work that requires inspection.
- C. The work of construction in all stages of progress is subject to the personal continuous observation of the Inspector. Provide Inspector with free access to any or all parts of the

work at any time. Provide Inspector with reasonable facilities for obtaining such information necessary to for the Inspector to be fully informed respecting the progress and manner of the work and the character of the materials. Inspection of the work does not relieve the Contractor from any obligation to comply with the Contract requirements.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION****3.1 DSA TESTS AND INSPECTIONS**

- A. Test and inspections for the following will be performed in conformance with the California Building Code, Title 24, Part 2, of the California Code of Regulations, and the DSA Interpretations of Regulations (IR) Manual.
- B. Structural tests and inspections will be performed in accordance with CBC Chapter 17A.
- C. Concrete (CBC Chapter 19A).
 - 1. Post-Installed Anchors:
 - a. Inspect installation: CBC Table 1705A.3.
 - b. Test post-installed anchors: CBC Section 1910A.5.
- D. Steel (CBC Chapter 22A and CBC Table 1705A.2.1).
 - 1. Structural Steel and Cold-Formed Steel Used for Structural Purposes:
 - a. Material Verification:
 - 1) Verify markings, mill certificates, sizes, types, and grades.
 - 2) Test unidentified materials: CBC Section 2202A.1; ASTM A370.
 - 3) Examine seam welds of structural tubes and pipes: DSA IR 17-3.
 - b. Inspection:
 - 1) Verify member locations and details constructed in field.
 - 2) Verify stiffener locations and details fabricated in shop.
 - 2. Welding: DSA IR 17-3; AWS D1.1; AWS D1.8.
 - a. Verification
 - 1) Verify weld filler identification markings.
 - 2) Verify weld filler material manufacturer's certificate of compliance.
 - 3) Verify WPS, welder qualifications, and equipment: DSA IR 17-3.

QUALITY REQUIREMENTS, DISTRICT LABORATORY**01 40 01 - 6****DEHESA SCHOOL MODERNIZATION**

b. Shop Welding

- 1) Inspect groove, multi-pass, and fillet welds $>5/16"$: AISC 360; DSA IR 17-3.
- 2) Inspect single pass fillet welds $\leq 5/16"$: AISC 360; DSA IR 17-3.

3.2 NON-DSA TESTS AND INSPECTIONS

A. Concrete Floor Slabs (Section 09 05 61.13 "Moisture Vapor Emission Control").

1. Testing for Moisture Vapor:

- a. Anhydrous calcium chloride vapor transmission tests: ASTM F1869.

2. Testing for Alkalinity:

- a. PH level tests: ASTM F710.

3. Shock Attenuation: No greater than 125 G(max) at time of installation according to ASTM F 1936.

3.3 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 01

SECTION 01 40 02
QUALITY REQUIREMENTS, CONTRACTOR LABORATORY

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control related to tests and inspections performed by Contractor's Testing Agency.
- B. Testing and inspection services specified in this Section will be performed by a Testing Agency selected and employed by the Contractor.
- C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by other Sections are not limited by provisions of this Section.
 - 4. Specific tests and inspections are not specified in this Section.
- D. Related Requirements:
 - 1. Section 01 40 01 "Quality Requirements, District Laboratory."
 - 2. Section 01 73 00 "Execution."

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by District.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
- D. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- E. Testing Agency: For this Section, an entity engaged by the Contractor to perform specific tests, inspections, or both.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: Provide or perform quantity or quality level shown or specified. Comply exactly with the minimum quantity or quality specified, or exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of three recent test reports issued by the Testing Agency on projects of comparable size and complexity.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Number of tests and inspections required.
 - 5. Time schedule or time span for tests and inspections.

6. Requirements for obtaining samples.

1.6 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 11. Name and signature of laboratory inspector.
 12. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement of whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
 1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement of whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

1.7 QUALITY ASSURANCE

- A. Testing and inspection services which are performed will be in accordance with requirements of CBC Title 24 Part 1, Administrative Code, where applicable.
- B. Testing and inspection services will verify that work meets the requirements of the Contract Documents.
- C. Provide test reports signed by a Registered Engineer licensed in the State of California for the specific type of testing required.
- D. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- E. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- F. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to District Construction Manager and Project Inspector. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 1. Notify Architect, District Construction Manager, Project Inspector and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 2. Submit a certified written report of each test, inspection, and similar quality-control service to Architect, District Construction Manager, and Project Inspector, with copy to Contractor.
 - 3. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 4. Retest and reinspect corrected work.
 - 5. Cooperate with Architect, District Construction Manager, Project Inspector, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 6. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 - 7. Do not perform any duties of the Contractor.
- G. Test reports will include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested will also be reported. Records of special sampling operations as required will be reported. The reports will show that the material or materials were sampled and tested in accordance with the requirements of the Contract Documents. They will also state definitely whether or not the material or materials tested comply with requirements.

H. Reporting Test Failures:

1. Immediately upon Testing Agency determination of a test failure, the Agency will notify the District Construction Manager by either telephone or e-mail. On the same day, the Testing Agency will send written test results to the Architect, District Construction Manager, Project Inspector, and Contractor.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by District Construction Manager.
2. Notify District Project Manager 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 District Construction Manager'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.
7. Demolish and remove mockups when directed unless otherwise indicated.

1.8 PAYMENTS

- A. Pay for costs of initial testing and inspection, except as specifically modified herein, or specified otherwise in technical sections. Initial tests and inspections are defined as the first tests and inspections as herein specified.
- B. In the event a test or inspection indicates failure of a material or procedure to meet requirements of Contract Documents, pay for costs for retesting and additional work related to failure at no additional expense to the District.
- C. Additional tests and inspections, not herein specified but requested by District, will be paid by District unless results of such tests and inspections are found to be not in compliance with Contract Documents, in which case the District will pay all costs for initial testing as well as retesting and reinspection. District will then backcharge the Contractor for these costs.
- D. At no additional expense to the District, pay for costs for additional tests or inspections required because Contractor changed materials or changed source or supply.
- E. At no additional expense to the District, pay for costs of tests or inspections that are required to correct deficiencies.

- F. At no additional expense to the District, pay for extra Testing Agency expenses resulting from a failure to notify the Testing Agency.
- G. At no additional expense to the District, pay for charges due to insufficient advance notice of cancellations or time extension.
- H. Cost of testing that is required solely for the convenience of Contractor in his scheduling and performance of work shall be paid by the Contractor.
- I. At no additional expense to the District, pay for overtime costs of testing and inspections performed outside the regular work day hours, including weekends and holidays. Such costs include overtime costs for the District's Representative.
- J. Should it be considered necessary or advisable by the District at any time before final acceptance of the entire work to make an examination of work already completed by removing or tearing out the completed work, promptly furnish necessary facilities, labor and materials. If such work is found to be defective in any respect due to fault of the Contractor or his subcontractor, pay for all expenses of such examinations and of satisfactory reconstruction at no additional cost to the District. If, however, such work is found to meet the requirements of the Contract, District will reimburse to the Contractor additional cost of labor and material necessarily involved in the examination and replacement.

1.9 QUALITY CONTROL

- A. Contractor Responsibilities:
 - 1. Engage a qualified testing agency to perform these quality-control services.
 - a. Do not employ same entity engaged by District.
 - 2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 3. Submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Pay for costs of retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents.
- B. Contractor Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify Testing Agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

4. Facilities for storage and field-curing of test samples.
 5. Preliminary design mix proposed for use for material mixes that require control by Testing Agency.
 6. Security and protection for samples and for testing and inspecting equipment at Project site.
 7. Selection of the material required to be tested will be by the Testing Agency or the District's Representative and not by the Contractor.
- C. Notify the Testing Agency a minimum of 3 working days in advance of the manufacture of material to be supplied under the Contract Documents, which must by terms of the Contract be tested. Agency will arrange for the testing of such material at the source of supply.
1. Do not incorporate into the Project material shipped by the Contractor from the source of supply before having satisfactorily passed such testing and inspection or before the receipt of notice from the District that such testing and inspection will not be required.
- D. Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule concurrently with Project Baseline Schedule.
1. After District review, distribute schedule to District Construction Manager, Project Inspector, Testing Agency, and each party involved in performance of portions of the Work where tests and inspections are required.
 2. Give sufficient advance notice to Testing Agency in the event of cancellation or time extension of a scheduled test or inspection.

1.10 PROJECT INSPECTOR

- A. An Inspector employed by the District will be assigned to the Work.
- B. Notify the Inspector a minimum of two working days in advance of execution of all work that requires inspection.
- C. The work of construction in all stages of progress is subject to the personal continuous observation of the Inspector. Provide Inspector with free access to any or all parts of the work at any time. Provide Inspector with reasonable facilities for obtaining such information as may be necessary for the Inspector to be fully informed respecting the progress and manner of the work and the character of the materials. Inspection of the work does not relieve the Contractor from any obligation to comply with the Contract requirements.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION****3.1 TEST AND INSPECTION LOG**

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to District Construction Manager.
 - 4. Identification of Testing Agency conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for District's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."
- B. Protect construction exposed by or for quality-control service activities.

- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 02

SECTION 01 42 00**REFERENCES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the General Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the General Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete in place and ready for the intended use.
- I. "Includes", "Including", and variations thereof: "Includes, but not limited to,..."

REFERENCES**01 42 00 - 1****DEHESA SCHOOL MODERNIZATION**

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
- D. For complete titles of individual Industry Standards, see United Master Reference List (UMRL) at <https://www.wbdg.org/ccb/DOD/UMRL/UMRL.pdf>.
 - 1. For titles of standards not included in the UMRL, see supplemental listing immediately following this section.

1.4 ABBREVIATIONS AND ACRONYMS

- A. The lists in this article are provided for the reader's convenience. This information is believed to be accurate as of the District Guide Specifications Section Version date at the end of this section, however, it is subject to change without notice.
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Where duplicates occur, use according to appropriate context and subject matter. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
 - 1. AABC - Associated Air Balance Council; www.aabc.com.
 - 2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
 - 3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
 - 4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
 - 5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
 - 6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
 - 7. ABMA - American Boiler Manufacturers Association; www.abma.com.
 - 8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.

REFERENCES

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DEHESA SCHOOL MODERNIZATION

9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International (formerly American Society for Testing and Materials); www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI – Building Industry Consulting Services International; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BS - British Standard

REFERENCES**01 42 00 - 3****DEHESA SCHOOL MODERNIZATION**

49. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
50. CDA - Copper Development Association; www.copper.org.
51. CE - Conformite Europeenne; <http://ec.europa.eu/growth/single-market/ce-marking/>
52. CEA - Canadian Electricity Association; www.electricity.ca.
53. CEA - Consumer Electronics Association; www.ce.org.
54. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
55. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
56. CGA - Compressed Gas Association; www.cganet.com.
57. CIF – California Interscholastic Federation
58. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
59. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
60. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
61. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
62. CPA - Composite Panel Association; www.pbmdf.com.
63. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
64. CRRC - Cool Roof Rating Council; www.coolroofs.org.
65. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
66. CSA - Canadian Standards Association; www.csa.ca.
67. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
68. CSI - Construction Specifications Institute (The); www.csinet.org.
69. CSSA – Certified Steel Stud Association; www.certifiedsteelstud.com
70. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
71. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
72. CWC - Composite Wood Council; (See CPA).
73. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
74. DHI - Door and Hardware Institute; www.dhi.org.
75. ECA - Electronic Components Association; (See ECIA).
76. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
77. ECIA - Electronic Components Industry Association; www.eciaonline.org.
78. EIA - Electronic Industries Alliance; (See TIA).
79. EIMA - EIFS Industry Members Association; www.eima.com.
80. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
81. EN - European Standard
82. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
83. ESTA - Entertainment Services and Technology Association; (See PLASA).
84. ETL - Intertek (See Intertek); www.intertek.com.
85. EVO - Efficiency Valuation Organization; www.evo-world.org.
86. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
87. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
88. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.

REFERENCES**01 42 00 - 4****DEHESA SCHOOL MODERNIZATION**

89. FM Approvals - FM Approvals LLC; www.fmglobal.com.
90. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
91. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridarooft.com.
92. FSA - Fluid Sealing Association; www.fluidsealing.com.
93. FSC - Forest Stewardship Council U.S.; www.fscus.org.
94. GA - Gypsum Association; www.gypsum.org.
95. GANA - Glass Association of North America; www.glasswebsite.com.
96. GRI – Geosynthetic Institute
97. GS - Green Seal; www.greenseal.org.
98. HI - Hydraulic Institute; www.pumps.org.
99. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
100. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
101. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
102. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
103. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
104. IAS - International Accreditation Service; www.iasonline.org.
105. IAS - International Approval Services; (See CSA).
106. ICBO - International Conference of Building Officials; (See ICC).
107. ICC - International Code Council; www.iccsafe.org.
108. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
109. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
110. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
111. IEC - International Electrotechnical Commission; www.iec.ch.
112. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
113. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
114. IESNA - Illuminating Engineering Society of North America; (See IES).
115. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
116. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
117. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
118. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
119. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
120. IPEMA - International Playground Equipment Manufacturers Association
121. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
122. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
123. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
124. ISO - International Organization for Standardization; www.iso.org.
125. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
126. ITU - International Telecommunication Union; www.itu.int/home.
127. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
128. LMA - Laminating Materials Association; (See CPA).
129. LPI - Lightning Protection Institute; www.lightning.org.

REFERENCES**01 42 00 - 5****DEHESA SCHOOL MODERNIZATION**

130. MBMA - Metal Building Manufacturers Association; www.mbma.com.
131. MCA - Metal Construction Association; www.metalconstruction.org.
132. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
133. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
134. MHIA - Material Handling Industry of America; www.mhia.org.
135. MIA - Marble Institute of America; www.marble-institute.com.
136. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
137. MPEG - Moving Picture Experts Group
138. MPI - Master Painters Institute; www.paintinfo.com.
139. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
140. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
141. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
142. NADCA - National Air Duct Cleaners Association; www.nadca.com.
143. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
144. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
145. NBI - New Buildings Institute; www.newbuildings.org.
146. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
147. NCMA - National Concrete Masonry Association; www.ncma.org.
148. NEBB - National Environmental Balancing Bureau; www.nebb.org.
149. NECA - National Electrical Contractors Association; www.necanet.org.
150. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
151. NEMA - National Electrical Manufacturers Association; www.nema.org.
152. NETA - InterNational Electrical Testing Association; www.netaworld.org.
153. NFHS - National Federation of State High School Associations; www.nfhs.org.
154. NFPA - National Fire Protection Association; www.nfpa.org.
155. NFPA - NFPA International; (See NFPA).
156. NFRC - National Fenestration Rating Council; www.nfrc.org.
157. NHLA - National Hardwood Lumber Association; www.nhla.com.
158. NICET - National Institute for Certification in Engineering Technologies
159. NLGA - National Lumber Grades Authority; www.nlga.org.
160. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
161. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
162. NRPA: National Recreation and Park Association; www.nrpa.org
163. NRCA - National Roofing Contractors Association; www.nrca.net.
164. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
165. NRTL - Nationally Recognized Testing Laboratory
166. NSF - NSF International (formerly National Sanitation Foundation); www.nsf.org.
167. NSPE - National Society of Professional Engineers; www.nspe.org.
168. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
169. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
170. NWFA - National Wood Flooring Association; www.nwfa.org.
171. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
172. PDI - Plumbing & Drainage Institute; www.pdionline.org.

REFERENCES

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173. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
174. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
175. RFCI - Resilient Floor Covering Institute; www.rfci.com.
176. RIS - Redwood Inspection Service; www.redwoodinspection.com.
177. SAE - SAE International; www.sae.org.
178. SATA-IO - Serial ATA International Organization
179. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
180. SDI - Steel Deck Institute; www.sdi.org.
181. SDI - Steel Door Institute; www.steeldoor.org.
182. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
183. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
184. SFIA - Steel Framing Industry Association; <https://sfia.memberclicks.net>
185. SHRP – Strategic Highway Research Program
186. SIA - Security Industry Association; www.siaonline.org.
187. SJI - Steel Joist Institute; www.steeljoist.org.
188. SMA - Screen Manufacturers Association; www.smainfo.org.
189. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
190. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
191. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
192. SPIB - Southern Pine Inspection Bureau; www.spib.org.
193. SPRI - Single Ply Roofing Industry; www.spri.org.
194. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
195. SSINA - Specialty Steel Industry of North America; www.ssina.com.
196. SSMA – Steel Stud Manufacturers Association; www.ssma.com
197. SSPC - The Society for Protective Coatings; www.sspc.org.
198. SSSA - Soil Science Society of America; <https://www.soils.org>.
199. STI - Steel Tank Institute; www.steeltank.com.
200. SWI - Steel Window Institute; www.steelwindows.com.
201. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
202. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
203. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
204. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
205. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
206. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
207. TMS - The Masonry Society; www.masonrysociety.org.
208. TPI - Truss Plate Institute; www.tpinst.org.
209. TPI - Turfgrass Producers International; www.turfgrasssod.org.
210. TRI - Tile Roofing Institute; www.tilerroofing.org.
211. UBPPA - Uni-Bell PVC Pipe Association; www.uni-bell.org
212. UL - Underwriters Laboratories Inc.; www.ul.com.
213. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
214. USAV - USA Volleyball; www.usavolleyball.org.

REFERENCES**01 42 00 - 7****DEHESA SCHOOL MODERNIZATION**

215. USCC - U.S. Composting Council; <https://compostingcouncil.org>.
216. USGBC - U.S. Green Building Council; www.usgbc.org.
217. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
218. WASTEC - Waste Equipment Technology Association; www.wastec.org.
219. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
220. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
221. WDMA - Window & Door Manufacturers Association; www.wdma.com.
222. WI - Woodwork Institute; www.wicnet.org.
223. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
224. WWPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
2. ICC - International Code Council; www.iccsafe.org.
3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.

REFERENCES

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19. USPS - United States Postal Service; www.usps.com.
- E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. ADA & ABA AG – Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines; <https://www.access-board.gov/attachments/article/412/ada-aba.pdf>.
 2. CBC - California Building Code; www.bsc.ca.gov/Home/Current2013Codes.aspx.
 3. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
 4. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
 5. DSCC - Defense Supply Center Columbus; (See FS).
 6. FED-STD - Federal Standard; (See FS).
 7. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
 8. MILSPEC - Military Specification and Standards; (See DOD).
 9. USAB - United States Access Board; www.access-board.gov.
 10. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CalTrans; State of California; Department of Transportation; www.dot.ca.gov
 2. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
 3. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
 4. CDHS; California Department of Health Services; (See CDPH).
 5. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
 6. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
 7. DSA; Division of the State Architect; www.dgs.ca.gov.
 8. DTSC; Department of Toxic Substances Control; www.dtsc.ca.gov.
 9. SDAPCD; San Diego Air Pollution Control district; www.sdapcd.org.

REFERENCES

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SUPPLEMENTAL LISTING OF INDUSTRY STANDARDS

- A. The list immediately following this section is provided for the reader's convenience. It is intended to be reasonably thorough, however, it does not purport to be comprehensive.

END OF SECTION 01 42 00

REFERENCES

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SUPPLEMENT to 01 42 00 REFERENCES	
ACI	
216.1	Determining Fire Resistance of Concrete and Masonry Construction Assemblies
318	318-14: Building Code Requirements for Structural Concrete and Commentary
350/350R	Code Req'ts for Environmental Engineering Concrete Structures and Commentary
530-11	Building Code Requirements and Specification for Masonry Structures and Related Commentaries (see also TMS 402 & ASCE 5-11)
503.3	Producing a Skid-Resistant Surface on Concrete by the Use of Epoxy and Aggregate
AAPFCO	
SUIP #25	Statements for Uniform Interpretation and Policy "The Heavy Metal Rule" Calculator
AASHTO	
LTS-6-M	Structural Supports for Highway Signs, Luminaires, and Traffic Signals
M 251	Plain and Laminated Elastomeric Bridge Bearings
C78.42	High Pressure Sodium Lamps
C78.43	Single Ended Metal Halide Lamps
C 79.1	Nomenclature for Glass Bulbs Intended for Use with Electric Lamps
C 80.1	Galvanized Rigid Conduit
C 80.3	Steel Electric Metallic Tubing
C 80.5	Electrical Rigid Aluminum Conduit
C 80.6	Electrical Intermediate Metal Conduit
C 81.61	Bases (Caps) for Electric Lamps
C 82.4	Ballasts for High-Intensity-Discharge & Low Pressure Sodium Lamps
C 82.11	High Frequency Fluorescent Lamp Ballasts
C136.31	Roadway and Area Lighting Equipment – Luminaire Vibration
E1.24	Entertainment Technology – Dimensional Requirements for Stage Pin Connectors
O5.2	Wood Poles
T 245	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
AIHA	
ELPAT	Environmental Lead Proficiency Analytical Testing Program
AISI	
1018	
1019	
1020	
ANSI	
C 62.41	Surge Voltage In Low Voltage Ac Power Circuits
A 108.10	Installation of Grout in Tile Work
A 118.4	Installation of Ceramic Tile
A 118.6	Ceramic Tile Grouts
ASCE	
6	Specification for Masonry Construction (see also ACI 530.1 & TMS 602)
5-11	Building Code Requirements and Specification for Masonry Structures and Related Commentaries (see also TMS 402 & ACI 530)
ASME	
B40.1	Same as B40.100
ASME B 15.1	Safety Standard for Mechanical Power
ASTM	

A74	Cast Iron Soil Pipe and Fittings
A126	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
A496	Steel Wire, Deformed, for Concrete Reinforcement
A497	Withdrawn. Replaced by ASTM A1064 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
A510	Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel
A564	Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes
A674	Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids
A775	Epoxy-Coated Reinforcing Steel Bars
A780	Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
A817	Metallic-Coated Steel Wire for Chain-Link Fence Fabric and Marcellled Tension Wire
A929	Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe
B8	Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
B16	Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines
B29	Refined Lead
B99	Copper-Silicon Alloy Wire for General Applications
B660	Packaging/Packing of Aluminum and Magnesium Products
B783	Materials for Ferrous Powder Metallurgy (PM) Structural Parts
C219	Standard Terminology Relating to Hydraulic Cement
C858	Underground Precast Concrete Utility Structures
C890	Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
C902	Pedestrian and Light Traffic Paving Brick
C913	Precast Concrete Water and Wastewater Structures
C1028	Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method (Withdrawn 2014)
C1093	Accreditation of Testing Agencies for Masonry
C1173 - 10	Flexible Transition Couplings for Underground Piping Systems
C1193	Use of Joint Sealants
C1277	Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings
C1314	Compressive Strength of Masonry Prisms
C1436	Materials for Shotcrete
C1479	Installation of Precast Concrete Sewer, Storm Drain, & Culvert Pipe
C1540	Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings
C1582	Admixtures to Inhibit Chloride-Induced Corrosion of Reinforcing Steel in Concrete
C1586	Quality Assurance of Mortars
C1623	Manufactured Concrete Masonry Lintels
D1816	Dielectric Breakdown Voltage of Insulating Oils of Petroleum Origin Using VDE Electrodes
D2751	Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
D3549	Thickness or Height of Compacted Bituminous Paving Mixture Specimens
D3963	Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars
D3977	Sediment Concentration in Water Samples
D4632	Grab Breaking Load and Elongation of Geotextiles
D4829	Expansion Index of Soils
D5329	Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements
D5926	Poly Vinyl Chloride (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems
D6916	Shear Strength Between Segmental Concrete Units (Modular Concrete Blocks)
D769	Black Synthetic Iron Oxide
E1444	Magnetic Particle Testing
E492	Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine
E989	Determination of Impact Insulation Class (IIC)
F606	Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets
F900	Industrial and Commercial Swing Gates
F934	Standard Colors for Polymer-Coated Chain Link Fence Materials

REFERENCES

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F969	Construction of Chain-Link Tennis Court Fence
F1136	Zinc/Aluminum Corrosion Protective Coatings for Fasteners
F1664	Poly(Vinyl Chloride) (PVC)-Coated Steel Tension Wire Used with Chain-Link Fence
F1668	Construction Procedures for Buried Plastic Pipe
F1936	Impact Attenuation of Turf Playing Systems as Measured in the Field
F2200	Automated Vehicular Gate Construction
F2223	Playground Surfacing
F2898	Permeability of Synthetic Turf Sports Field Base Stone and Surface System by Non-confined Area Flood Test Method
H 35.1	Wire Rods and Coarse Round Wire, Aluminum Material: Alloy 6063-T6
AWPA	
UC4A	Use Category System: User Specification for Treated Wood
AWWA	
C219	Bolted, Sleeve-Type Couplings for Plain-End Pipe
C506	Backflow Prevention Devices - Reduced Pressure Principle & Double Check Valve Types
M41	Ductile-Iron Pipe and Fittings
CA AB	
AB 1953	Re: Lead-free plumbing
CALTRANS	
Test cv 227	Evaluating Cleanness of Coarse Aggregate
CCR	
8 CCR 1637	Scaffolds
8 CCR 1760	Low-Voltage Electrical Safety Orders
8 CCR 1922	Portable Fire Fighting Equipment
8 CCR 2405.5	Ground-Fault Circuit Protection-Construction Site
8 CCR 3203	Injury and Illness Prevention Program
22 CCR 66261	Identification and Listing of Hazardous Waste
CDPH	
Form 8551	Abatement of Lead Hazards Notification
CEA	
(Consumer Electronics Association)	
310-E	Design Requirements for Cabinets, Panels, Racks, and Sub-racks
542-B	Cable Television Channel Identification Plan
2032	Performance of Indoor TV Antennas
CFR	
29 CFR 1910.7	Appendix A: Definition and Requirements for a Nationally Recognized Testing Laboratory
29 CFR 1910.141	Sanitation
29 CFR 1910.157	Portable Fire Extinguishers
29 CFR 1910.269	Electric Power Generation, Transmission, and Distribution
29 CFR 1910.304	Wiring Design and Protection
29 CFR 1926.404	
29 CFR 1926.58	This standard 1926.58 was redesignated to 1926.1101 in the Federal Register, August 10, 1994, page 40964.
40 CFR 257	Criteria For Classification Of Solid Waste Disposal Facilities And Practices
40 CFR 141	National Primary Drinking Water Regulations
49 CFR 171.8	Hazardous Materials - North American Shipments - Definitions & Abbreviations
49 CFR 173.155	Limited Quantities of Class 9 Materials
CSA	

REFERENCES

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DEHESA SCHOOL MODERNIZATION

Z245.20	External Fusion Bond Epoxy Coating for Steel Pipe
C22.2 No. 137	Electric Luminaires for Use in Hazardous Locations
DOD	(see also MIL)
DOD-P-21035B	Military Specification - Paint High Zinc Dust Content, Galvanizing Repair (Metric)
EN	
EN 15330	Surfaces for Sports Areas
EPA	
Method No. 8020	Aromatic Volatile Organics by Gas Chromatography
Tier 2	Vehicle and Gasoline Sulfur Program
Tier 3	Vehicle Emission and Fuel Standards Program
Tier 4	Emission Standards Regarding diesel engines used in many types of Construction
ESTA/ AASHTO	
E1.11	Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment
USITT DMX 521-A	and Accessories
FED-STD	
595	Colors Used in Government Procurement
FM	
Class No. 3990	Less- or Non-Flammable Liquid Insulated Transformers
GRI	
GG1	Geogrid Rib Tensile Strength
GG2	Geogrid Junction Strength
ICC	
300	Bleachers, Folding and Telescopic Seating and Grandstands Standard
ICEA	
CS 8	Extruded Dielectric Shielded Power Cables
S 93.639	5-46 kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy
S 95-658	Power Cables Rated 2000 Volts or less for Distribution of Electrical Energy
S 97.682	Utility Shielded Power Cables Rated 5 through 46 kV
T 31.610	Longitudinal Water Penetration Resistance Tests on Blocked Conductors
ICRI	
310.2	Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair
IEC	
60061-1	Lamp Caps and Holders Together With Gauges for the Control of Interchangeability and Safety
60929	AC-Supplied Electronic Ballasts for Tubular Fluorescent Lamps
IEEE	
18	Shunt Power Capacitors
43	Testing Insulation Resistance of Rotating Machinery
48	Alternating Current Cable Terminations Used on Shielded Cables having Laminated Insulation
81	Measuring Earth Resistivity, Ground Impedance, and Earth Potentials of a Grounding System
344	Seismic Qualification of Equipment for Nuclear Power Generating Stations

REFERENCES

01 42 00 - 14

DEHESA SCHOOL MODERNIZATION

576	Installation, Termination, and Testing of Insulated Power Cable as Used in Industrial and Commercial Applications
802.1x	Port-based Network Access Control
802.3af	Power over Ethernet
802.11	Telecommunications and Information Exchange between Systems – Local and Metropolitan Area Networks – Specific Requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications
802.11b	Wireless LAN Technology
802.11g	Wireless Local Area Networks (WLANS) that Offers Transmission Over Relatively Short Distances at up to 543 Mbps
1100	Powering and Grounding Electronic Equipment
1284	Parallel Port Standard
C37.20.4	Indoor AC Switches (1 kV to 38 kV) for Use in Metal-Enclosed Switchgear
C57.12.36	Liquid-Immersed Distribution Sub-Station Transformers
IES	
LM 5	Photometric Measurements of Area and Sports Lighting Installations
LM 45	Electrical & Photometric Measurement of General Service Incandescent Filament Lamps
LM 46	Photometric Testing of Indoor Luminaires Using High Intensity Discharge or Incandescent Filament Lamps
LM 50	Photometric Measurements of Roadway Lighting Installations
LM 52	Photometric Measurements of Roadway Sign Installations
LM 64	Photometric Measurements of Parking Areas
LM 72	Directional Positioning of Photometric Data. Lighting Measurements Testing and Calculation Guides
LM 79	Electrical and Photometric Measurements of Solid State Lighting Products
NA RP 6	Recommended Practice for Sports and Recreational Area Lighting
NA RP 16	Nomenclature and Definitions for Illuminating Engineering
LPI	
175	Design, Installation, Inspection of Lightning Protection Systems
MFMA	
4	Metal Framing Standards Publication 204
MIL	
C-882E	Cloth, Duck, Cotton Or Cotton-Polyester Blend, Synthetic Rubber, Impregnated, and Laminated, Oil Resistant
MPEG	
4, Part 10	Standard for Video Compression
NACE	
1	Good Workmanship in Electrical Contracting
101	Installing Steel Conduits (Rigid, IMC, EMT)
102	Installing Aluminum Rigid Metal Conduit
402	Installing and Maintaining Motor Control Centers
407	Installing and Maintaining Panel Boards
430	Installing Medium-Voltage Metal-Clad Switchgear
NCMA	
TEK 8-4A	Cleaning Concrete Masonry
NEMA	
C 12.11	Instrument Transformers for Revenue Metering: 10kV Bil through 350 kV (0.6 kV NSV through 69 kV NSV)
CP1	Shunt Trip Capacitors

REFERENCES

01 42 00 - 15

DEHESA SCHOOL MODERNIZATION

FB-2.10	Fittings for Use with Non-Flexible Conduit or Tubing (Rigid Metal Conduit, Intermediate Metal Conduit)
FB-2.20	Selection and Installation Guidelines for Fittings for Use with Flexible Electrical Conduit and Cable
FB 11	Classified location plugs, receptacles, and connectors (Hazardous Location)
FG1	Fiberglass Cable Tray Systems
ICS 2	Controllers, Contactors, and Overload Relays Rated 600V
ICS 7	Adjustable-Speed Drives
ICS 18	Industrial Control and Systems. Motor Control Centers
ICS 61800-2	Standards for Adjustable Speed Electrical Power Drive Systems
ICS 61800-3	Adjustable Speed Electrical Power Drive Systems Part 3: EMC Requirements and Specific Test Methods
LE 4	Recessed Luminaires, Ceiling Compatibility
LE 6	Procedure for Determining Target Efficacy Ratings for Commercial, Industrial, and Residential Luminaires
OS-1	Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports
OS-2	Non-Metallic Outlet Boxes, Device Boxes, Covers, and Box Supports
PB 1.1	Installation, Operation, and Maintenance of Panel Boards Rated 600 V or less
PB 2.1	Handling, Installation, Operation, and Maintenance of Dead Front Distribution Switchboards Rated 600 V or less
RV-3	Application and Installation Guidelines for Flexible and Liquid-Tight Flexible Metal Conduits
TC 14	Reinforced Thermosetting Resin Conduit
TCB 2	Selection and Installation of Underground Non-Metallic Duct
TP2	Test Method for Measuring the Energy Consumption of Distribution Transformers
NFPA	
250	Enclosures for Electrical Equipment (1000 V Maximum)
262	Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces
312	Fire Protection of Vessels During Construction, Repair, or Lay-up
508A	Industrial Control Panels
NICET	
Levels 1&2	Certification for Low Voltage Professionals for Installation and Maintenance of Fire Alarm Systems
NRDCA	
National Roof Deck Contractors Association	
NOMMA	
Guideline 1	Joint Finishes
RCRA	
Resource Conservation and Recovery Act	
SATA-IO	
SATA Standard	Serial Advanced Technology Attachment Standard for Connecting Hard Drives into Computer Systems
SB460	
California Senate Bill on Lead Abatement	
SDAPCD	
Rule 67	Metal Container, Metal Closure, and Metal Coil Coating Operations
Rule 67.01	Architectural Coatings – Proposed Repeal of Existing Rule 67.0
Rule 67.21	Adhesive Material Application Operations
SHRP	
H-348	Asphalt Pavement Repair Manuals of Practice
H-349	Concrete Pavement Repair Manuals of Practice

REFERENCES

01 42 00 - 16

DEHESA SCHOOL MODERNIZATION

SIA	
BIO-1	Speaker Profile and Speaking Topics
CP-01	False Alarm Reduction
DC-03	"SIA Format" Protocol – for Alarm System Communications
DC-07	Digital Communication Standard – for Central Station Equipment Communications
PIR-01	Passive Infrared Motion Detectors
TVAC	CCTV Access Control Standard – Message Set for System Integration
TIA/EIA	
310D	Cabinets, Racks, Panels, and Associated Equipment
492AAAD	Telecommunications Distribution Methods
526-14-B	One Reference Jumper Method for Measuring Attenuation in a Structured Cabling Application
529-B	Canadian Standard equivalent to TIA/EIA 568-B
568-B	Cable Color Code Standard on Each End of a Straight-Through 10/100Base T Cable
568-B-1	Commercial Building Telecommunications Cabling Standard
568-B.2	Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components
568-B.3	Components and Transmission Requirements for Optical Fiber Cabling
569-A&B	Commercial Building Standards for Telecommunications Pathways and Spaces
569-C.1	Revised Temperature and Humidity Requirements for Telecommunications Spaces
598-B	Standard for Colors. Fiber/Unit NumberS 1-9
598-C	Optical Fiber Type Identification Scheme for Color Coding or Marking
604-2	Optical Fiber Cabling Components
604-2B	Fiber Optic Connector Intermateability
604-3A	Simplex and Duplex Connectors. Stable Performance: o <0.2dB typical MM. o <0.15dB typical SM
604-3B	Fiber Optic Connector Intermateability, Type SC and SC-APC
604-12	Optical Fiber Connector Intermateability MT-RJ
606-B	Updated Labeling Standard – Adopts Identification Scheme specified in TIA/EIA 606-A
TMS	
402	Building Code Requirements and Specification for Masonry Structures and Related Commentaries (see also ACI 530 & ASCE 5-11)
602	Specification for Masonry Construction (see also ACI 530.1 & ASCE 6)
UL	
5A	Non-Metallic Surface Raceways and Fittings
6A	Rigid Metal Conduit – Aluminum, Red Brass, and Stainless Steel
96A	Installation Requirements for Lightning Protection Systems
651B	Requirements for Type EB and Type A extruded rigid PVC (Polyvinyl Chloride) electrical conduit and fittings
717	Ducts and Air Transfer Openings
810	Capacitors
813	Commercial Audio Equipment
886	Outlet Boxes and Fittings, for Use in Hazardous (Classified) Locations
917	Clock-Operated Switches
1053	Ground Fault Sensing and Relaying Equipment
1062	Unit Substations
1244	Electrical and Electronic Measuring and Testing Equipment
1277	Electrical Power and Control Tray Cables with Optional Optical Fiber Members
1436	Outlet Circuit Testers and Similar Indicating Devices
1562	Distribution Transformers, Dry-Type – Over 600 Volts
1573	Stage and Studio Luminaires and Connector Strips
1651	Optical Fiber Cable Standard

REFERENCES

01 42 00 - 17

DEHESA SCHOOL MODERNIZATION

SPECIFICATIONS**NO. 22-0400**

1655	Construction, Test, and Marking Requirements Covering the Safety of Community-Antenna Television Cables
1684A	Supplemental Requirements for Extra Heavy Reinforced Wall
1685	Vertical Tray Fire Propagation and Smoke Release Test for Electrical and Optical Fiber Cables
1711	Amplifiers for Fire Protective Signaling Systems
1773	Termination Boxes
2024	Cable Routing Assemblies and Communications Raceways
2075	Gas and Vapor Detectors and Sensors
2200	Stationary Engine Generator Assemblies
2572	Mass Notification Systems
Category Code VZCA	Certification, as a minimum, listing the tested values for VPRs, nominal ratings, MCOVs, type designations, OCPDs
FS W-C-596	Mechanical and Electrical Life of Modular Wiring Devices
FS W-S-896	Switches, Toggles (Toggle and Lock), Flush Mounted

REFERENCES**01 42 00 - 18****DEHESA SCHOOL MODERNIZATION**

SECTION 01 45 01
ENVIRONMENTAL TESTING OF IMPORTED FILL MATERIALS

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes the requirements for sampling, testing, and certification of imported fill material to District sites.
- B. Related Requirements:
 - 1. Section 01 40 02 "Quality Requirements / Contractor Laboratory" for testing related costs, scheduling, and other requirements.
 - 2. Section 31 20 00 "Earth Moving."

1.3 DEFINITIONS

- A. Borrow Site(s): The source location(s) of the imported fill material.
- B. District: San Diego Unified School District.
- C. DTSC: California Department of Toxic Substances Control Information Advisory, Clean Imported Fill Material, dated October 2001.
- D. Environmental Professional: A licensed California Professional Engineer (PE) or Professional Geologist (PG) hired by the Contractor.
- E. Imported Fill Material: Any earth or soil brought to the District site for which the source location is not located within the property boundary of that same District site. This term does not include gravel, rock, earth, or soil generated from within the property boundary of the District site.
- F. Obvious Contamination: Indicators of possible contamination, include discoloration, odors, debris, or other man-made materials.
- G. Testing Agency: The testing agency hired by the Contractor to perform all tests described herein.

1.4 ACTION SUBMITTALS

- A. Sampling and Analysis Plan (SAP) prepared and signed by the Contractor's Environmental Professional. At a minimum the SAP shall include:
1. Scaled maps showing the location of the Borrow Site(s) and the locations of the stockpiles or in-place soil.
 2. The volumes of the stockpiles or in-place soil proposed for import.
 3. The depth of excavation for the removal of in-place soil.
 4. A sampling rationale and approach, including the proposed sampling protocol, number of samples, and the analytical testing suite.
 5. Contact information for the Borrow Site(s) and a proposed sampling schedule.
 6. If available, the SAP should include detailed information on the current and previous use of the Borrow Site(s) (i.e., for at least the last 50 years) and information from any environmental site assessments or clean ups performed at the Borrow Site, including laboratory analytical testing reports. This information should be utilized to support the proposed sampling rationale and approach. It is the responsibility of the Contractor to request this information from the Borrow Site(s) or obtain the information from readily available public resources. If sufficient information regarding the previous land use is not available to support a specific sampling rationale or approach, samples shall be analyzed as described herein. Guidance for the sampling frequency and recommended target analytes for previous and current Borrow Site(s) land uses are provided in Table 1 and 2 at the end of this Section.
- B. Import Fill Material Certification Report (IFMCR) prepared and signed by the Contractor's Environmental Professional. At a minimum, the draft IFMCR shall include:
1. Scaled maps showing the location of the Borrow Site(s), the locations of the stockpiles or in-place soil, the soil sample locations, and the area at the District site where the import fill material will be placed.
 2. Description of soil sampling activities, including sampling methodology and procedures.
 3. Summary of laboratory analytical results, including data summarized in a tabular format.
 4. Discussion and evaluation of laboratory analytical results as it relates to potential risks to human health and the environment, which must include an evaluation of potential risks to workers, schoolchildren, and District employees utilizing the current DTSC model.
 5. Recommendations for additional steps, if any.
 6. Copies of laboratory analytical testing reports with chain of custody and quality assurance and quality control documentation.
 7. A copy of the Import Fill Material Certification Form (at the end of this Section) signed by the Contractor's Environmental Professional and the Contractor. Request a copy from the District.

1.5 INFORMATIONAL SUBMITTALS

ENVIRONMENTAL TESTING OF IMPORTED FILL MATERIALS

01 45 01 - 2

DEHESA SCHOOL MODERNIZATION

- A. Qualification Data: For Environmental Professional and testing agency.
- B. Written documentation prior to import activities verifying that the proposed import fill material from the Borrow Site(s) meets the geotechnical requirements specified in the Contract Documents.
- C. Written documentation from the Contractor prior to import activities verifying that the hauling contract specifies the use of only clean trucks and that the actual trucks utilized for import activities will be clean of obvious contamination and deleterious materials.
- D. Written documentation from the Contractor that the haul trucks traveled directly from the Borrow Site(s) to the District site without stopping at other locations and that short loads were not augmented with soil or materials not tested as part of the SAP. It is the Contractor's responsibility to provide this documentation within 5 days of the completion of import activities. All transportation activities shall be conducted in accordance with applicable local, State, and Federal rules and regulations.
- E. Copies of haul tickets and/or bills of lading documenting all import activities. The haul tickets and/or bills of lading shall contain the following information:
 - 1. Date and time of departure from the Borrow Site(s).
 - 2. Date and time of arrival at the District site.
 - 3. Address of Borrow Site and District site.
 - 4. Load volume and/or weight.
 - 5. Signature of the receiving site representative as designated by the Contractor.
- F. "1.5F": See Import Fill Material Certification Report (IFMCR) provision in ACTION SUBMITTALS article above. (This note is intended to correct the erroneous cross reference at the end of the Import Fill Material Certification Form at the end of this Section.)
- G. Statement signed by Contractor and Environmental Professional verifying compliance with requirements of the SAP.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An analytical testing laboratory accredited by the California Department of Health Services (DHS) to perform analysis of imported fill materials.
- B. Environmental Professional Qualifications: A licensed California Professional Engineer (PE) or Professional Geologist (PG) knowledgeable of, and experienced in, environmental site assessment, waste classification, disposal requirements, and environmental regulations pertaining to school projects, and who has had recent environmental experience performing soil sampling and waste characterization (i.e., within one year).

ENVIRONMENTAL TESTING OF IMPORTED FILL MATERIALS**01 45 01 - 3****DEHESA SCHOOL MODERNIZATION**

PART 2 - PRODUCTS (Not used.)**PART 3 - EXECUTION****3.1 TEST AND INSPECTION LOG**

- A. In addition to the requirements of Section 01 40 02 "Quality Requirements / Contractor Laboratory," maintain a separate three-ring binder containing all information required for this Section. Update the binder weekly. Bring the binder to all Progress Meetings and Monthly Schedule Review Meetings until earth moving is complete.

3.2 COORDINATION

- A. Limit the length of time between sampling of soil and delivery of imported soil to site to no more than [21] twenty-one days.
- B. Import no earth or fill materials without the prior written consent of the District.

3.3 SAMPLING AND TESTING

- A. Test all import fill material at the point of origin, unless prior written approval is obtained from the District. Include the following in the import fill material testing and certification process:
 - 1. Select a Borrow Site(s) for the imported fill material.
 - 2. Submit a SAP to the District for review and comment.
 - 3. If necessary, submit a revised SAP after incorporating revisions requested by the District, and receive approval from the District.
 - 4. Collect and analyze samples in accordance with the District approved SAP.
 - 5. Submit an IFMCR and a signed copy of the Import Fill Material Certification Form to the District for review and comment.
 - 6. If necessary, submit a revised IFMCR after incorporating revisions requested by the District, and receive approval from the District.
 - 7. Prior to import activities, submit written documentation verifying that the import fill material tested meets the geotechnical requirements specified in the Contract Documents.
 - 8. Prior to import activities, submit written documentation that only clean trucks without obvious contamination or deleterious materials will be utilized to haul import fill material from the Borrow Site(s) to the District site.
 - 9. After import activities, submit written documentation that the haul trucks traveled directly from the Borrow Site(s) to the District site without stopping at other locations and that short loads were not augmented with soil or materials not tested as part of the SAP and copies of haul tickets and/or bills of lading documenting all import activities.

ENVIRONMENTAL TESTING OF IMPORTED FILL MATERIALS**01 45 01 - 4****DEHESA SCHOOL MODERNIZATION**

10. After import activities, submit haul tickets and/or bills of lading as specified above.
 11. After import activities, submit a statement signed by Contractor and Environmental Professional verifying compliance with requirements of the SAP, as specified above.
- B. Import fill material is deemed approved for import only when it has been documented to the satisfaction of the District that the fill material meets the requirements of this Section. District reserves the right to refuse any fill material proposed for use at a District site.
- C. Analyze samples in accordance with the applicable portion of Table 2 based on information regarding the previous land use. If sufficient information regarding the previous land use is not available to support a specific sampling rationale or approach, analyze all samples as described below. The detection limits and quality assurance/quality control methods must meet the requirements of the standard reporting limits and best laboratory practices for the United States Environmental Protection Agency (USEPA) test method requested below:
1. California Code of Regulations Title 22 (CAM 17) Metals by USEPA test method 6010B/7471A.
 2. Total petroleum hydrocarbons as gasoline, diesel, and motor oil by United States Environmental Protection Agency (USEPA) test method 8015(B)M.
 3. Volatile Organic Compounds by USEPA test method 8260B/5035.
 4. Semi-Volatile Organic Compounds by USEPA test method 8270C.
 5. Organochlorine Pesticides by USEPA test method 8081A.
 6. Organophosphorus Pesticides by USEPA test method 8141A.
 7. Chlorinated Herbicides by USEPA test method 8151A.
 8. Polychlorinated Biphenyls by USEPA test method 8082.
- D. Import fill material will be deemed unacceptable for use on a District site by the District if any of the following analytical testing results are obtained:
1. Total Petroleum hydrocarbons are present at concentrations exceeding 100 milligrams per kilogram (mg/kg) for gasoline and 1,000 mg/kg for diesel/motor oil.
 2. Volatile organic compounds are present at concentrations meeting or exceeding the laboratory reporting limit.
 3. Semi-volatile organic compounds are present at concentrations meeting or exceeding the laboratory reporting limit.
 4. Organochlorine or organophosphorus pesticides are present at concentrations meeting or exceeding the laboratory reporting limit.
 5. Chlorinated herbicides are present at concentrations meeting or exceeding the laboratory reporting limit.
 6. Arsenic is present in any sample at a concentration at or above 12 mg/kg.
 7. Lead is present in any sample at a concentration at or above 80 mg/kg.
 8. The cumulative health risk for all detected Title 22 metals except lead and arsenic indicates a significant health risk to workers, schoolchildren, and District employees.

ENVIRONMENTAL TESTING OF IMPORTED FILL MATERIALS**01 45 01 - 5****DEHESA SCHOOL MODERNIZATION**

9. The soil would be classified as waste as defined by California Code of Regulations Title 22 or Code of Federal Regulations Title 40.
- E. Import fill material with concentrations of contaminants above the screening levels identified in this document will be deemed suitable by the District for use on a District site if supported by a site-specific human health risk assessment, which may require final approval from the DTSC.
- F. Approvals of analytical testing results by the District are valid for a period of 21 days from the date of testing unless a written variance is obtained from the District.
- G. Request Specification Variance: Submit a written request to the District accompanied by the laboratory analytical testing report and a justification to support the request. The District will review the request and provide an initial determination within 5 days. Contractor is responsible for timely processing of submittal, including final approval from the DTSC.

3.4 SAMPLE FORMS

- A. See following pages.

Table 1 - Recommended Fill Soil Sampling Schedule

Area of Individual Borrow Area/Stockpile	Sampling Requirements
Borrow Area/In-Place Material	
2 acres or less	Minimum of 4 samples
2 to 4 acres	Minimum of 1 sample per every 1/2 acre
4 to 10 acres	Minimum of 8 samples
Greater than 10 acres	Minimum of 8 locations with 4 subsamples per location
Stockpiled Material	
1,000 cubic yards or less	1 sample per 250 cubic yards or portion thereof (minimum of 4 samples)
1,001 to 5,000 cubic yards	4 samples for the first 1,000 cubic yards, plus one sample per each additional 500 cubic yards or portion thereof
Greater than 5,000 cubic yards	12 samples for the first 5,000 cubic yards, plus one sample per each additional 1,000 cubic yards or portion thereof

Note:

Information obtained from the DTSC's Information Advisory, Clean Imported Fill Material (October 2001)

Table 2 - Potential Contaminants Based on the Borrow Site Land Use

Borrow Site Current or Historical Land Use	Target Compounds
Land near and existing freeway	Lead (USEPA Method 6010B) Polynuclear Aromatic Hydrocarbons (USEPA 8310)
Land near a mining area or rock quarry	Title 22 (CAM 17) Metals (USEPA 6010B/7471A) pH
Agricultural Land	Organochlorine Pesticides (USEPA 8081A) Organophosphorus Pesticides (USEPA 8141A) Chlorinated Herbicides (USEPA 8151A) Title 22 (CAM 17) Metals (USEPA 6010B/7471A)
Residential/Commercial Land	Volatile Organic Compounds (USEPA 8206B/5035) Semi-Volatile Organic Compounds (USEPA 8270C) Total Petroleum Hydrocarbons (USEPA 8015(B)M) Polychlorinated Biphenyls (USEPA 8082) Title 22 (CAM 17) Metals (USEPA 6010B/7471A) Organochlorine Pesticides (USEPA 8081A) Asbestos (OSHA Method ID-191)

Notes:

OSHA - Occupational Safety and Health Administration

PLM - polarized light microscopy

USEPA - United States Environmental Protection Agency

Information obtained from the DTSC's Information Advisory, Clean Imported Fill Material (October 2001)

SAMPLE FORM

Import Fill Material Certification Form**I. Contractor Information**

Company Name: _____
Company Address: _____
City: _____ State: _____ Zip Code: _____
Contact Person: _____
Phone: _____ Fax: _____
E-mail: _____

II. Environmental Professional Information

Company Name: _____
Company Address: _____
City: _____ State: _____ Zip Code: _____
Contact Person: _____
Phone: _____ Fax: _____
E-mail: _____
Type of License/Registration: _____ License/Registration Number: _____

III. Borrow Site Information

Site Address: _____
City: _____ State: _____ Zip Code: _____
Property Owner Name: _____
Property Owner Address: _____
City: _____ State: _____ Zip Code: _____
Contact Person: _____
Phone: _____ Fax: _____
E-mail: _____
Current Land Use: _____
Historical/Previous Land Use(s): _____
Estimated Volume of Soil for Export: _____

SAMPLE FORM

Import Fill Material Certification Form**IV. School Facility Information**

School/Facility Name: _____

School/Facility Address: _____

City: _____ State: _____ Zip Code: _____

Contact Person _____

Phone: _____ Fax: _____

E-mail: _____

V. Representative Sample Certification

Is/Are the representative sample(s) collected to prepare this certification form and the laboratory analysis performed in accordance with Section 01 45 01 of the Specifications, the approved Sampling and Analysis Plan, and the Contract Documents? Yes

Was the soil sampled in-place or in a stockpile(s)? In-Place

Sample Collection Date(s): _____

Sample ID Number(s): _____

Sampler's Name: _____

VI. Import Soil Characteristics

Were any indicators of contamination or deleterious materials observed? Yes No

Does the import soil meet the requirements of Section 01 45 01 of the Specifications and the Contract Documents? Yes No

Does the import soil meet the geotechnical requirements specified in the Contract Documents? Yes No

VII. Certification

I/We further certify that by utilizing this soil certification form, neither I/we nor any other employee of the company(ies) or agent for company(ies) will deliver for import or attempt to deliver for import any material that does not meet with the requirements of Section 01 45 01 of the Specifications or the Contract Documents or that has not been approved in writing for import to a San Diego Unified School District site. I/We shall immediately provide written notice of any change or condition pertaining to the import fill soil not provided herein. Our company(ies) hereby agree(s) to fully indemnify and defend the San Diego Unified School District against any damages resulting from this certification being inaccurate or untrue.

SAMPLE FORM

Import Fill Material Certification Form

I/We, certify that the above is true and correct, and that the source site does not appear on any state, local, or federal hazardous sites list, including but not limited to the federal "superfund list." To the best of my knowledge, fill to be imported to the project site also meets with applicable local, state, and federal standards, and has never been utilized for industrial and/or commercial use where hazardous materials were used, handled or stored as part of the business operation or as an unpaved parking area. To the best of my knowledge, the fill to be imported meets with applicable requirements of California Department of Toxic Substances Control (DTSC), which administers both state and federal hazardous waste programs including but not limited to the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 U.S.C. §§9601-9675), the Toxic Substances Control Act (TSC, 42 U.S.C. §§2601-2692) and a number of other State and Federal bodies of law dealing with hazardous materials and the environment

I/We agree to provide true, correct copies of any documentation relating to the import fill or the source site, within 5 days of written request by San Diego Unified School District

_____ Contractor Authorized Representative Name/Title (type or print)	_____ Company Name
_____ Contractor Authorized Representative Signature	_____ Date
_____ Environmental Professional Authorized Representative Name/Title (type or print)	_____ Company Name
_____ Environmental Professional Authorized Representative Signature	_____ Date

This form shall be submitted as an attachment to the Import Fill Material Certification Report described in Section 01 45 01, Part 1.5 F.

END OF SECTION 01 45 01

**SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.
 - 2. Section 01 57 23 "Temporary Storm Water Pollution Control" for storm water requirements during construction.
 - 3. Section 32 13 13 "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.
 - 4. Section 32 84 00 "Planting Irrigation"

1.3 USE CHARGES

- A. General: Installation, removal of, maintenance, cleaning, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in project to use temporary services and facilities without cost, including District, Architect, testing agencies, and authorities having jurisdiction.
 - 1. Water Service: Pay water-service use charges for water used by all entities for construction operations.
 - 2. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel. If locations are not indicated on Drawings, request locations from District Project Manager.

- B. Storm Water Pollution Prevention Plan: Provide Storm Water Pollution Prevention Plan per Section 01 57 23 "Temporary Storm Water Pollution Control".
- C. Water Pollution Control Plan: Provide Water Pollution Control Plan per Section 01 57 23 "Temporary Storm Water Pollution Control".
- D. Moisture-Protection Plan as specified herein.
- E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.
 - 3. Location of proposed air-filtration system discharge.
 - 4. Waste handling procedures.
 - 5. Other dust-control measures.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with California Electrical Code current edition.
- B. Moisture-Protection: Protect materials and construction from water absorption and damage. Protect during delivery, handling, and storage. Discard water-damaged materials, mitigate water intrusion into completed Work, and replace water damaged Work.
- C. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- D. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and California Building Code. .

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before District's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 8 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Securely embed fence posts into ground to avoid fence turnover.
 - 1. Provide securely fastened continuous screening fabric on portable chain link fence.]
- B. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- C. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

2.2 TEMPORARY FACILITIES

- A. All field offices and sanitary facilities must comply with applicable codes and regulations, including disabled accessibility regulations.
 - 1. Field Offices and Sanitary Facilities: The District does not require field offices or sanitary facilities for this Project.
- B. Contractor's Field Office and Sanitary Facilities:
 - 1. The Contractor's Field Office: Equip with lockable entrances, operable windows and serviceable finishes, and heating and ventilation on foundations adequate for normal loading. Provide adequate space for a conference table with sufficient seating for ten (10) people. Provide the sanitary facilities, wash facilities and drinking water as required by applicable codes and regulations.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations. Store combustible materials away from building(s).

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Provide electrically powered HVAC for field office.

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- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- C. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: **[Install temporary service.] [Connect to existing service.]**
 - 1. Arrange with utility company, District, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- C. Water Service: Connect to District's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to District. At Substantial Completion, restore these facilities to condition existing before initial use.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas. Isolate work area from occupied areas of building.

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1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
1. Install electric power service overhead unless otherwise indicated.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- 3.3 SUPPORT FACILITIES INSTALLATION
- A. General: Comply with the following:
1. Provide construction for temporary offices, shops, and sheds located within construction area.
 2. Maintain support facilities until Substantial Completion.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 31 20 00 "Earth Moving."
 3. Recondition base after temporary use, including removing contaminated material, regrading, proof rolling, compacting, and testing.
 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 32 12 16 "Asphalt Paving."
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Provide temporary parking areas for construction personnel.
- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 1. Project Identification Sign: Provide Project identification sign as indicated on Drawings.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touch up signs so they are legible at all times.
- H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 73 00

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"Execution." Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

- I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- K. Existing Stair Usage: Use of District's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to District. At Substantial Completion, restore stairs to condition existing before initial use.
 - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.
- L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 TREE, PLANT, AND IRRIGATION SYSTEM PROTECTION

- A. Take all measures necessary to protect existing trees, plants and irrigation that is to remain. Measures include, without limitation, substantial barricades to prevent damage. Maintain existing plant materials within the area of Work that are to remain, including periodic watering, trimming, and weeding. Install temporary fencing located to protect vegetation and irrigation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- B. Inspect the irrigation system with the Project Inspector to determine existing conditions prior to commencement of Work. Repair, replace, or correct damage to existing irrigation system and plant materials caused by Contractor operations without adjustment to the Contract Time or the Contract Price. The repair, replacement, or correction of existing plant materials and irrigation system shall bring both to their original condition prior to construction, as determined by the Project Inspector.
- C. Ensure existing irrigation systems are operable during selective demolition. Provide temporary power to controller. Provide temporary water source to existing mainline within and outside of project limits as required to maintain an operable system during demolition and construction. If temporary power and/or water is unavailable, hand water existing plant materials within and outside of project limits until automatic system is restored.

- D. Provide a qualified arborist who shall certify that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- E. Temporary Fencing: Install temporary fencing located as indicated or outside the drip line of trees to protect remaining vegetation from construction damage.
 - 1. Install chain link fence according to ASTM F 567 and manufacturer's written instructions.
- F. Protect tree root systems from damage due to noxious materials caused by runoff or spillage while mixing, placing, or storing construction materials. Protect root systems from flooding, eroding, or excessive wetting caused by dewatering operations.
- G. Do not store construction materials, debris, or excavated material within the drip line of remaining trees. Do not permit vehicles or foot traffic within the drip line; prevent soil compaction over root system.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain prior written permission from the District.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for District. Perform control operations lawfully, using environmentally safe materials approved by authorities having jurisdiction.
- D. Site Enclosure Fence: Before construction operations begin, provide site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

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- E. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
 - 1. Provide and maintain temporary barricades at all hazardous areas to protect both pedestrians and vehicles at all times. This protection shall be for students, faculty and all others at both offsite and onsite work. Adjust and relocate barricades as necessary for protection as work progresses to different locations. Areas that require barricades include such things as trenches, changes to sidewalks/driveways and projections above ground.
- G. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
- I. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by District from fumes and noise.
 - 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 - 2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
 - 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 - 4. Insulate partitions to control noise transmission to occupied areas.
 - 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 - 6. Protect air-handling equipment.
 - 7. Provide walk-off mats at each entrance through temporary partition.

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- J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking on District property.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.6 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 3. Avoid trapping water in finished work. Indicate methods to be used to avoid trapping water in finished work.
 4. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.

5. Do not install material that is wet.
 6. Discard, replace, or clean stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use permanent HVAC system to control humidity.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to the District Project Manager.
 - c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. District reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by School District. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION 01 50 00

**SECTION 01 50 10
FURNISHINGS AND EQUIPMENT MOVING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following:
 - 1. Preparing and packing furniture, supplies, and equipment for moving.
 - 2. Moving furniture, supplies, and equipment to new locations.
 - 3. Storing furniture, supplies, and equipment both on and off-site.
 - 4. Setting up the rooms after moving to a temporary location.
 - 5. Setting up the rooms in their permanent location after construction has been completed.
- B. Related requirements:
 - 1. Section 01 32 33 "Photographic Documentation."

1.3 PRE-MOVING CONFERENCE

- A. Pre-Moving Conference: Conduct conference at Project site.
- B. Convene a pre-moving conference two weeks prior to commencing work of this Section.
- C. Discuss method of digital video and/or photography of all rooms, use of the District provided inventory list, labeling and marking each box, predetermining damage to existing materials and finishes; identify method and responsibility for repairs after moving; review the intended route for moving; discuss coordination with affected storage areas and facilities, both on and off the site.
- D. Discuss coordination of the moves with the phasing of the work, including the use of the relocatables for storage during school breaks.
- E. Discuss means and methods of relocating existing classrooms to and from temporary relocatable classrooms or other identified swing space / interim housing. Coordinate with the CPM schedule.

1.4 ACTION SUBMITTALS

- A. Electronic copies of all digital videos and / or photographs.

1.5 INFORMATIONAL SUBMITTALS

- A. Documentation of bonding compliance and insurance coverage for mover and storage facilities, in accordance with the General Conditions.
- B. Documentation of Professional Mover experience specified above.

1.6 SCHEDULING

- A. Arrange schedule with District's requirements for sequence of work under this contract.
- B. Coordinate the moves within the CPM schedule, including the moves to and from temporary relocatable classrooms or other identified swing space / interim housing.
 - 1. Schedule moves to and from relocatables during weekends or school breaks.

1.7 INSTRUCTIONS

- A. Professional Mover shall be responsible for all packaging, labeling, and moving of all items that leave their room of origin for storage on site, off-site, or to any other room or building within school site.
- B. Subcontracting of packing, moving, or storage to other than the listed Moving and Storage Contractor is prohibited without prior written District approval.
- C. Floor mounted copy machines shall be moved by District's copy machine service company. District will provide contact name and phone numbers of service companies maintaining copiers and Contractor shall coordinate, contract and pay for moving of copy machines under an allowance provided as part of base bid.
- D. Package, move, relocate, and store items without disruption of school operations.
- E. Prior to beginning construction work in each area, relocate furniture, equipment, books, and supplies to temporary storage, or other preapproved on-site areas. After work in each area is completed, relocate furniture, equipment, books, and supplies from their temporary location and place them back in their original rooms, in their original locations.
- F. [The use of temporary relocatable classrooms for storage during school breaks is allowed with written permission of the District. Protect walls and floors of relocatables from damage, and repair all damage to satisfaction of District Project Manager.
- G. Coordinate work with District's security program.

- H. Report all missing or stolen items to District .

1.8 ITEMS TO BE MOVED

- A. Professional Mover under General Contractor shall be responsible for packaging, moving, storing, and resetting the following items:
1. Items indicated on the drawings.
 2. Items in storage areas.
 3. Desks, tables, chairs, portable cabinets, and portable book shelves.
 4. Books and supplies.
 5. Flags, fire extinguishers, maps, etc.
 6. Teaching, instructing, demonstrating, and other materials and equipment.
 7. Filing cabinets, and other portable classroom and office equipment.
 8. Computers, printers, copiers, phones, audio visual equipment, and all similar electronic equipment.
 9. Operations, maintenance, cleaning, grounds-keeping, and similar material and equipment.
 10. Industrial Art classrooms: (Wood, metal, and machine shops), all portable and counter mounted equipment, including drill presses, scroll saws, sanders, electric planners, etc, floor mounted equipment, including lathes, table saws, drill presses, bands saws, work tables, kilns, all hand tools, jigs, and class supplies including wood, sheet metal, clay, etc. Disconnect all floor mounted and hard wired equipment.
 11. Science laboratories: Including microscopes, balances, glassware, chemicals, including hazardous materials, class supplies, and demonstrational items, including skeletons, models, etc.
 12. Photography laboratories: Including enlargers, printers, dryers, developers, cameras, class supplies and equipment, and chemicals.
 13. Art Classrooms: Including kilns, easels, student projects, classroom supplies, etc.
 14. Weight and Exercise rooms: Including floor and wall mounted equipment, free weights, mats, etc.
 15. Athletic equipment storage: Including uniforms, pads, mats, shoes, helmets, etc.
 16. Theater: Including props, flats, furniture, costumes, etc.
 17. Music Classroom: Including stands, instruments supports, instruments, uniforms, sheet music, and class supplies.
 18. Portable library bookcases, and library books.
 19. Interactive whiteboard systems.

1.9 DISTRICT PERSONNEL/TEACHERS PERSONAL ITEMS

- A. Personal items belonging to District personnel/teachers, (non-District owned items) will be packaged by District personnel/teachers who own them, using packing materials and boxes provided by Contractor, and either removed from site or moved by District personnel/teachers.

PART 2 - PRODUCTS**2.1 MOVING EQUIPMENT**

- A. Equipment and Moving Equipment: Provide all moving and storage boxes and equipment as required for a successful furnishings and equipment move.
- B. Provide all required off-site and on-site storage as required to temporarily store all removed items.
- C. Provide waterproof tarps, blankets, boxes, and securing materials to transport materials to prevent water and rain damage and prevent damage to individual items.
- D. All off-site storage shall be within a climate controlled secure, insured warehouse within 10 miles of Project site.
- E. Provide ocean-going storage containers for on-site storage, when space is available for containers and approved by the District.
- F. Provide 50 - 12" x 18" x 17" boxes and tape for each classroom, 75 - 12" x 18" x 17" boxes and tape for each kindergarten classroom, 100 - 12" x 18" x 17" boxes and tape for the library, 60 - 12" x 18" x 17" boxes and tape for administration, 10 - 12" x 18" x 17" for each individual office, and 50 - 12"x 18" x 17" boxes and tape for each book or storage room, whose contents are to be packed and moved. Some boxes will be used by staff to pack personnel items. Boxes shall be delivered to site ten (10) days prior to move date.
- G. Provide larger boxes suitable for packing monitors, CPU, and keyboards together. Provide one box for each computer system. Provide boxes of correct size and construction for ancillary equipment.
- H. Provide book carts (wheeled storage shelving) in sufficient number for moving and storing the entire library.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. In conjunction with District Construction Manager, digitally video or photograph existing conditions and original locations of all furnishings and equipment prior to start of removal work. Coordinate with Section 01 32 33 "Photographic Documentation." Video / photographs will be used to locate and position furnishings and equipment to their original position before interim storage and for resetting up rooms after moves. Supply a copy of digital video or photographs to District. Orally on videos and written on a separate index sheet for photographs, identify each room number and area and describe any information pertinent to locating materials. In addition, provide a written

inventory to District of all items packed, moved and stored along with a list of any damaged items. The District will provide preprinted inventory list forms for the Contractor's use.

- B. Prior to each move, estimate number and types of containers to be used and have them on site 48 hours prior to a move.
- C. Verify with District availability of staging areas.
- D. Inspect materials equipment and furnishing thoroughly and notify District in writing of visible defects and damage.
- E. Compile a list of visible defects to material, finishes, accessories and fabrics. This list will form the basis of comparing required repair work after the move.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate with District Personnel the tagging and disconnection of all furniture and equipment to be relocated. Tag all items, equipment, and boxes. Label each box on two sides with room number and teacher name that they came from. Clearly label boxes containing phones, 'This box contains a phone'.
- B. List each item, piece of equipment, or box on the moving inventory control sheet along with any district property numbers or other identifying marks. Use a separate inventory sheet or set of sheets for each separate room from which materials are being moved.
- C. Record on a damage identification sheet the tag number, District property number or other identifying marks, and any damage noted prior to the move. District Move Representative will initial each item of damage report prior to moving that item.
- D. Obtain the signature of District Move Representative on each sheet of Move Inventory Record verifying that it is a true record of all items removed from each room.
- E. Secure materials to prevent shifting of loads.
- F. Box, wrap, tape, and provide cover.
- G. Items that are to be stored in non-climate controlled ocean-going containers, which can be damaged by temperature exceeding 90 degrees (i.e. crayons, computers, electronic equipment, etc.), shall be boxed separately and stored in either a secure, insured warehouse or within one of the school buildings.
- H. Protect furnishings and equipment from damage including: denting, scratching, scuffing, cracking, racking and tearing.
- I. During move, protect adjacent structures and property from damage caused by moving of contract materials. Repair any damage at no cost to District.

- J. Notify District Project Manager two weeks prior to disconnecting, packaging, or moving any computers and computer accessories. District will arrange to have computers properly shut down before they are disconnected by Moving Contractor.
- K. Coordinate with District Project Manager for contact information to arrange for moving of any copier equipment.

3.3 PACKAGING AND LOADING

- A. Use packaging materials to prevent damage to furnishings, supplies, and equipment.
- B. Computers and other electronic technology systems shall be packaged together complete with all cords, monitors, CPU, keyboards, and mouse. Either package devices in one separate box or shrink-wrap each separate system.
- C. Provide protective coverings. Wrap each individual piece of glassware.
- D. Move materials in manner to prevent damage.
- E. Move furnishings and equipment, control speed and provide restraining devices so shift of loads does not occur.
- F. All equipment which is not moved shall be protected from damage during project. Protect all equipment, material, and boxed items from any inclement weather conditions.

3.4 TRANSPORT VEHICLES

- A. Professional Mover shall provide transport vehicles for moving furnishings and equipment to and from all on-site and off-site storage facilities.

3.5 MOVING TO RELOCATABLES OR OTHER SWING SPACE OR INTERIM HOUSING

- A. When moving classrooms to temporary relocatable classrooms, swing space or interim housing, all requirements specified herein for moving still apply with the following additional requirements:
 - 1. All furniture, supplies, and equipment for each separate classroom shall be moved to designated relocatable or other swing space, and furniture and equipment set up for teaching.
 - 2. All boxes shall also be moved and neatly stacked at far end of relocatable or other swing space.

3.6 STORAGE FACILITIES

- A. Position and locate materials in orderly fashion within storage facilities.

- B. Coordinate with District for exact staging.
- C. Set all materials on pallets or temporary bases raised from floor to prevent damage.
- D. Store computer systems, other electronic devices, and items susceptible to heat damage in secured, climate-controlled spaces.

3.7 REPAIR OF DAMAGE

- A. Repair damage to furnishings and equipment not identified in writing prior to reinstalling or, if required by District, replace with new furnishings or equipment of equal or better quality, if, as determined by the District, they cannot be successfully repaired. All damaged items shall be repaired within 21 days.
- B. Replace all missing items within 21 days.
- C. Refinish repaired surfaces to original condition to satisfaction of District.

3.8 REINSTALLATION

- A. Utilizing recorded digital video or photographs taken prior to relocation, identify furnishings and equipment and reinstall, to satisfaction of District, to their original location.
- B. Remove protective wrappings and clean all materials.
- C. Coordinate with District reconnection of all equipment. District will be responsible for final reconnection of all computer systems.
- D. Obtain signature of the District Move Representative on each sheet of Move Inventory Record verifying that all items listed have been successfully moved. Report any missing items to District Police.

3.9 CLEANING

- A. Clean all re-installed, non-boxed items, material, and equipment after installation.
- B. Remove moving equipment and materials from final site.

END OF SECTION 01 50 10

SECTION 01 56 39
TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general protection, pruning, and care of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Requirements:
 - 1. Section 01 50 00 "Temporary Facilities and Controls" for temporary site fencing.
 - 2. Section 31 10 00 "Site Clearing" for removing existing trees and shrubs.

1.3 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape at a height 6 inches above the ground for trees up to and including 4-inch size at this height and as measured 12 inches above the ground for trees larger than 4-inch size.
- B. Drip Line: The width of the canopy of the tree as measured by the lateral extent of the foliage on all sides.
- C. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.
- E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site a minimum of two weeks before Work of this Section is to commence.

1. Review methods and procedures related to temporary tree and plant protection, including:
 - a. Tree-service firm's personnel, and equipment needed to make progress and avoid delays.
 - b. Arborist's responsibilities.
 - c. Quality-control program.
 - d. Coordination of Work and equipment movement with the locations of protection zones.
 - e. Trenching by hand or with air spade within protection zones.
 - f. Field quality control.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 1. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.
 2. Indicate extent of trenching by hand or with air spade within protection zones.
- C. Samples: For each type of the following:
 1. Organic Mulch: 1-quart volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
- D. Tree Preservation Schedule: Schedule, written by the arborist, detailing scope and extent of work to be performed to preserve and protect existing trees to remain that interfere with or are affected by construction.
 1. Species and size of tree.
 2. Location of tree on site plan. Include unique identifier for each.
 3. Location of protection zone for each tree.
 4. If arborist determines pruning is required, provide reason for pruning, description of pruning to be performed, and description of maintenance procedures following pruning.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For arborist and tree service firm.
- B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

- C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
- D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
 - 1. Use sufficiently detailed photographs or video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- E. Quality-control program.

1.7 QUALITY ASSURANCE

- A. Arborist Qualifications: Certified Arborist as certified by the International Society of Arboriculture (ISA) or a Registered Consulting Arborist as designated by ASCA.
- B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

1.8 FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Storage or use of equipment and non-related construction activities, including pipe-cutting machines, tile-cutting machines, and lumber saws.
 - 3. Storage or dumping of deleterious materials harmful to plant growth. Deleterious materials might include fuels, oils, other petroleum products, acids, liquids, concrete mix or concrete washout, stucco mix or stucco washout, paint or paint washout, and zinc grindings from working with galvanized products in the field.
 - 4. Soil disturbance or grade change.
 - 5. Moving or parking vehicles or equipment, even temporarily.
 - 6. Foot traffic.
 - 7. Erection of sheds or structures.
 - 8. Drainage changes or impoundment of water.
 - 9. Excavation or other digging unless otherwise indicated.

10. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
 11. The use of a tree as a temporary power pole, backstop, winch support, anchorage, or other similar function.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Backfill Soil: Planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.
1. Planting Soil: Fertile, friable, surface soil, containing natural loam and complying with ASTM D 5268. Provide topsoil that is free of stones larger than 1 inch in any dimension and free of other extraneous or toxic matter harmful to plant growth. Obtain topsoil only from well-drained sites where soil occurs in depth of 4 inches or more; do not obtain from bogs or marshes.
- B. Organic Mulch: Free from deleterious materials, animal waste, sludge waste, lumber or C&D wood by-products, trash and debris, and suitable as a top dressing of trees and shrubs.
1. Type: Ground tree trimming, wood, and bark.
 2. Size Range: 1/2 inch to 2-inch diameter.
 3. Color: Natural, no dyes.
 4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Agriservice, Inc.
 - b. Plant's Choice, Inc.
 - c. Whittier Fertilizer.
 - d. San Pasqual Valley Soils.
- C. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements. Previously used materials may be used when approved by District Construction Manager.
1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch-diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch-OD line posts, and 2-7/8-inch-OD corner and pull

TEMPORARY TREE AND PLANT PROTECTION**01 56 39 - 4****DEHESA SCHOOL MODERNIZATION**

posts; with 0.177-inch-diameter top tension wire and 0.177-inch-diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.

- a. Height: 72 inches.
- 2. Gates: Single-or Double- swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width 36 inches.
- D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:
 - 1. Lettering: 3-inch-high minimum, black characters on white background.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. Prepare written report, authored by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Tie a 1-inch blue vinyl tape around each tree trunk at 54 inches above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.
 - 1. Apply 3-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

3.3 PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people and animals from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
 - 1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
 - 2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to District Construction Manager.
 - 3. Access Gates: Install; adjust to operate smoothly, easily, and quietly; free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by District Construction Manager. Install one sign spaced approximately every 20 feet on protection-zone fencing, but no fewer than four signs with each facing a different direction.
- C. Maintain protection zones free of weeds and trash.
- D. Maintain protection-zone fencing and signage in good condition as acceptable to District Construction Manager and remove when construction operations are complete and equipment has been removed from the site.
 - 1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
 - 2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 31 20 00 "Earth Moving" unless otherwise indicated.
- B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as

required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

- A. Root pruning shall not be attempted by untrained construction personnel, but shall be performed by a qualified tree care professional or a certified tree care worker. Only personnel approved by the arborist shall perform pruning operations.
- B. Prune tree roots that are affected by temporary and permanent construction. Prune roots as directed by the arborist or as follows. If direction from arborist is different from what is stated below, then direction from arborist governs.
 - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 - 2. Cut Ends: Treat as directed by arborist.
 - 3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
 - 4. Cover exposed roots with burlap and water regularly.
 - 5. Backfill as soon as possible according to requirements in Section 31 20 00 "Earth Moving."
- C. Root Pruning at Edge of Protection Zone: Prune tree roots 6 inches outside of the protection zone by cleanly cutting all roots to the depth of the required excavation.
- D. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

- A. Crown pruning shall not be attempted by untrained construction personnel, but shall be performed by a qualified tree care professional or a certified tree care worker. Only personnel approved by the arborist shall perform pruning operations

- B. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.
 - 1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
 - 2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
 - 3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
 - a. Type of Pruning: Cleaning and thinning] as directed by arborist.
 - b. Specialty Pruning: as directed by arborist.
- C. Unless otherwise directed by arborist and acceptable to District Project Manager, do not cut tree leaders.
- D. Cut branches with sharp pruning instruments; do not break or chop.
- E. Do not paint or apply sealants to wounds.
- F. Provide subsequent maintenance pruning during Contract period as recommended by arborist.
- G. Chip removed branches and dispose of off-site.

3.7 REGRADING

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
 - 1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.
- C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- D. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.8 FIELD QUALITY CONTROL

- A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports. Submit inspection reports monthly.

3.9 MAINTENANCE

- A. Irrigation: Supplemental irrigation shall be applied to moisten the soil within the protection zone to the depth of the existing root system, typically in the top 2 to 3 feet of soil, and to then replace that moisture once it is depleted. Irrigation frequency and depth shall be based on the needs of the individual tree. Irrigation applications performed on a schedule are not acceptable, as many variables determine the individual tree's needs (age of tree, size of tree, soil type, aspect, weather, time of year, extent of root pruning, etc). Light, frequent irrigation applications shall be avoided. Apply water deeply, thoroughly, and infrequently, by a method directed by the arborist. Water used in supplemental irrigation applications shall be clean potable water from a reliable source.
- B. Where temporary clearance is needed for adjacent access, tree branches shall be temporarily tied back to hold them out of the clearance zone, with approval by the arborist. Tied branches shall be protected with burlap or other protective material to prevent wounding and chafing.
- C. Dust Control: Tree shall be maintained in a clean fashion throughout the length of the Work. During periods of demolition, clearing & grubbing, grading activities, post-wind, or simply time, gently spray the foliage, trunks, and branches with clean potable water to remove construction dust. Do not utilize pressure washers, large streams of water with high volumes, or other insensitive methods to clean the foliage.
- D. Area inside the tree protection zone shall be maintained in a neat manner, removing excessive leaf build-up, fallen twigs and branches, or debris deposited by winds or other causes.
- E. When installing concrete adjacent to the tree protection zone, install a plastic vapor barrier behind the concrete to prohibit leaching of lime into the soil.
- F. Pest and Disease Control: Notify the arborist if any symptoms of pest or disease are observed. Provide appropriate measures to prevent or remedy pests and diseases, as directed by the arborist.

3.10 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by District Construction Manager.

1. Submit details of proposed pruning and repairs.
 2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by District Construction Manager.
- B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that District Construction Manager determines are incapable of restoring to normal growth pattern.
1. Small Trees: Provide new trees of same size and species as those being replaced for each tree that measures 10 inches or smaller in caliper size.
 2. Large Trees: Project Arborist shall determine the tree appraisal value for damage and replacement using the most recent edition of the *Guide for Plant Appraisal*, authored by the Council of Tree and Landscape Appraisers (CTLA), and published by the International Society of Arboriculture (ISA), Champaign, IL. The formula used shall also be noted.
 - a. Species: As selected by District Project Manager.
 3. Plant and maintain new trees as specified in Section 32 93 00 "Plants."
- C. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 3 inch uniform thickness to remain.
- D. Soil Aeration: Aerate surface soil compacted during construction. Aerate 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2 inch diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augered soil and sand.
- 3.11 DISPOSAL OF SURPLUS AND WASTE MATERIALS
- A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off District property.

END OF SECTION 01 56 39

SECTION 01 57 23**TEMPORARY STORM WATER POLLUTION CONTROL****PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Requirements:
1. Contractor shall exercise every reasonable precaution to protect channels, storm drains, and bodies of water from pollution.
 2. Schedule and conduct operations to minimize or avoid muddying and silting channels, drains, and waters.
 3. As required, obtain permits for erosion and water pollution control from the appropriate jurisdictional agency before starting Work.
 4. Provide any necessary water pollution control devices to prevent, control, and abate water pollution, and implement good housekeeping pollution control measures to reduce the discharge of pollutants from Work sites to the maximum extent practicable. These water pollution control devices include drains, gutters, slope protection blankets and retention basins, and shall be constructed concurrently with other Work at the earliest practicable time.
 5. Exercise care in preserving vegetation and protecting property to avoid disturbing areas beyond the limits of the Work. Promptly repair any damage caused by Contractor operations.
 6. Comply with the specific requirements based on acreage of disturbed soil.
 7. Penalties: Failure to comply with this Section may result in significant fines and possible imprisonment. The RWQCB or other prosecuting authority may assess fines of up to \$32,500 per day for each violation. Should Owner be fined or penalized as a result of Contractor failing to comply with this Section, Contractor shall reimburse Owner for any and all fines, penalties and related costs.
 8. Notification and report: If pollution occurs in the Work area for any reason or when Contractor becomes aware of any violation of this Section, correct the problem and immediately notify the Inspector. In addition, submit a written report to the Engineer within seven (7) calendar days describing the incident and the corrective actions taken. If either the Inspector or Engineer is first to observe pollution or a violation, Contractor shall also explain in the written report why the Work was inadequately monitored.
 9. The provisions of this Section describe minimum compliance and do not preclude other more stringent stormwater pollution control measures that may be required in the Contract.

1.3 DEFINITIONS

- A. Construction Activity: Operations such as clearing; grading; disturbances to the ground, such as stockpiling; or excavation that results in soil disturbances. If construction activity is part of a larger common plan of development, the amount of disturbed soil is the total land area of disturbed soil that results under the common plan.

TEMPORARY STORM WATER POLLUTION CONTROL**01 57 23 - 1****DEHESA SCHOOL MODERNIZATION**

1.4 LIABILITIES AND PENALTIES

- A. Payment of penalties for noncompliance by Contractor shall be the sole responsibility of Contractor.
- B. Compliance with the Clean Water Act is the sole responsibility of Contractor. Owner shall recover all costs of any fine against Owner due to noncompliance by Contractor by appropriate Owner Assessment.

PART 2 (NOT USED)**PART 3 EXECUTION****3.1 GENERAL**

- A. Construction activity:
 - 1. Comply with the following minimum water quality protection requirements:
 - a. Retain eroded sediments and other pollutants onsite and do not allow transportation from the site by sheet flow, swales, area drains, natural drainage, or wind. Control slope and channel erosion by implementing an effective combination of best management practices (BMPs). Such BMPs include scheduling grading during non-rainy seasons, planting and maintaining vegetation on slopes, and covering erosion-susceptible slopes.
 - b. Protect stockpiles of earth and other construction-related materials from being transported from the site by wind or water.
 - c. Properly store and handle fuels, oils, solvents, and other toxic materials to not contaminate the soil or surface waters, enter the groundwater, or be placed where they may enter a live stream, channel, drain, or other water conveyance facility. Protect all approved toxic storage containers from weather. Clean spills immediately and properly dispose of cleanup materials. Spills shall not be washed into live streams, channels, drains, or other water conveyance facilities:
 - 1) If rain or storm water runoff comes in contact with pollutants (such as soil stabilizers, paint, or fluid from vehicles) report to Inspector immediately.
Contractor will be required to sample and remediate contaminated water.
 - d. Do not wash excess or waste concrete into the public way or any drainage system. Retain concrete wastes onsite until they can be appropriately disposed of or recycled.
 - e. Deposit trash and construction-related solid wastes in covered receptacles to prevent contamination of rainwater and dispersal by wind.
 - f. Do not allow sediments and other materials to be tracked from the site by vehicle traffic. Stabilize construction entrance roadways to inhibit sediments from being deposited onto public ways. Immediately sweep up accidental depositions. Do not allow depositions to be washed away by rain or by any other means.
 - g. Contain non-stormwater runoff from equipment or vehicle washing and any other activity at the worksite.
 - h. At completion of the Work, clear the worksite of debris and restore to a condition at least equal to or better than prior to construction.

3.2 MAINTENANCE

- A. To ensure the proper implementation and functioning of control measures, Contractor shall regularly inspect and maintain the construction site. Contractor shall identify corrective

TEMPORARY STORM WATER POLLUTION CONTROL**01 57 23 - 2****DEHESA SCHOOL MODERNIZATION**

actions and time needed to address any deficient measures or reinitiate any measures that have been discontinued. Inspections of the construction site shall be conducted by Contractor to identify deficient measures, as follows:

1. Prior to a forecasted storm.
 2. At 24-hour intervals during extended precipitation events.
 3. After all precipitation that causes runoff capable of carrying sediment from the construction site.
 4. Routinely, at a minimum of once every week during the rainy season (October 1st – April 30th) and once every month during the non-rainy season (May 1st – September 30th).
- B. All temporary and/or permanent post-construction control measures shall be maintained and regularly inspected by Project Contractor after all improvements are in place and accepted by Owner. Temporary and/or permanent post-construction landscaping maintenance shall include, but not be limited to, watering, seeding, hydro-seeding, matting, slope stabilization, re-vegetation, and any other maintenance control measures recommended by Owner to insure proper erosion control and plant growth.

END OF SECTION 01 57 23

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and "or equal" products.
- B. Related Requirements:
 - 1. Section 01 21 00 "Allowances" for products selected under an allowance.
 - 2. Section 01 23 00 "Alternates" for products selected under an alternate.
 - 3. Section 01 25 00 "Substitution Procedures" for requests for substitutions.
 - 4. Section 01 42 00 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. "or equal" Product: Product that is demonstrated and approved through the substitution request process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the

basis-of-design product description, product attributes and characteristics may be listed to establish significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating “or equal” products of additional manufacturers.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

6. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to District.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for District.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCTS NOT ALLOWED

- A. Do not provide products that contain asbestos, lead, or coal tar.

2.2 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. District reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. For products specified by name and accompanied by the term "or equal," comply with requirements of Section 01 25 00 "Substitution Procedures" to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Where Specifications name a single manufacturer's product and indicate "no substitution", provide the named product that complies with requirements. "or equal" products (substitutions) will not be considered.
2. Where Specifications name a single manufacturer or source and indicate "no substitution", provide a product by the named manufacturer or source that complies with requirements. "or equal" products (substitutions) will not be considered.
3. Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. "or equal" products (substitutions) will be considered.
4. Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. "or equal" products (substitutions) will be considered unless expressly specified otherwise.
5. Basis-of-Design Product: Where Specifications name a product as the basis-of-design product, or refer to a product indicated on Drawings as the basis-of-design product, provide the specified or indicated product. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. "or equal" products (substitutions) will be considered.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select features such as color, gloss, pattern, density, texture from manufacturer's product line.

PART 3 - EXECUTION

3.1 COLOR CONSISTENCY

- A. All like finish products within a given visible area shall be from the same dye lot or color run.
- B. If like finish products within a given visible area vary slightly in color, mix and blend varying colors to avoid distinct areas of color variation.

END OF SECTION 01 60 00

SECTION 01 73 00**EXECUTION****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of District-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
 - 9. Correction of the Work.
- B. Related Requirements:
 - 1. Section 01 10 00 "Summary" for limits on use of Project site.
 - 2. Section 01 33 00 "Submittal Procedures" for submitting surveys.
 - 3. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of District-accepted deviations from indicated lines and levels, and final cleaning.
 - 4. Section 02 41 19 "Selective Demolition" for demolition and removal of selected portions of the building.
 - 5. Section 07 84 13 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

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1.4 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site a minimum of two weeks before work is to commence
 - 1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
 - a. Contractor's superintendent.
 - b. Trade supervisor responsible for cutting operations.
 - c. Trade supervisor(s) responsible for patching of each type of substrate.
 - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affecting by cutting and patching operations.
 - 2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 ACTION SUBMITTALS

- A. Cutting and Patching Request
 - 1. Submit Cutting and Patching Plan describing procedures at least 10 days prior to the time cutting and patching will be performed.
 - 2. Include the following information:
 - a. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - b. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - c. Products: List products to be used for patching, including product data and patching details, and firms or entities that will perform patching work.
 - d. Dates: Indicate when cutting and patching will be performed.
 - e. Contractor's stamp, Contractor's name, Project location and name, Contractor's signature acknowledging review of Cutting and Patching Request, including Cutting and Patching Plan.
 - f. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - 1) Include description of provisions for temporary services and systems during interruption of permanent services and systems.

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3. Obtain Inspector's approval prior to commencing cutting and patching work. Approval does not waive District's right to require removal and replacement of unsatisfactory cutting and patching work.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Qualification Data: For franchise utility project manager.
- C. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- D. Landfill Receipts: Submit copies of waste hauler slips indicating the amount of waste hauled in tons and the amount of waste in tons diverted from landfill and recycled, composted or salvaged.
- E. Certified Surveys: Submit two copies signed by land surveyor.

1.7 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in California and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Structural Elements: When cutting and patching structural elements, notify the Architect and IOR of locations and details of cutting, and await directions from the District Construction Manager before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Plumbing piping systems.
 - f. Mechanical systems piping and ducts.
 - g. Control systems.
 - h. Communication systems.

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- i. Fire-detection and -alarm systems.
 - j. Conveying systems.
 - k. Electrical wiring systems.
 - l. Operating systems of special construction.
 - m. Weather barriers.
 - n. Thermal protection systems, including insulation assemblies.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include the following:
- a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in the District Construction Manager's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

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DEHESA SCHOOL MODERNIZATION

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site to District Project Manager 10 days prior to start of work.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine surfaces, substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and District Construction Manager that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify the District IOR promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify the District IOR when deviations from required lines and levels exceed allowable tolerances.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and project Inspector.

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3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, survey monuments, temporary control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and survey monuments during construction operations.
 - 1. If any existing permanent benchmark will be destroyed as a result of construction, notify District Construction Manager in writing before such destruction occurs. Do not disturb benchmark until City forces have established necessary control to set a new permanent benchmark and District Construction Manager has given written permission to proceed.
 - 2. If any survey monument will be destroyed as a result of construction, before such destruction occurs, notify District Construction Manager in writing. Engage a Land Surveyor to survey as necessary and prepare Pre-construction Corner Record complying with the California Professional Land Surveyors Act. Section 8771. File Pre-construction Corner Record with San Diego County Surveyor. Send a copy of preliminary Corner Record to District Construction Manager. Do not disturb survey monument until Pre-construction Corner Record is received and accepted by County and written permission is obtained from District Construction Manager. After lost monument has been replaced, engage a Land Surveyor to file a final Corner Record (or a Record of Survey if required) with San Diego County Surveyor.
- B. Benchmarks: Establish and maintain a minimum of [2] two temporary benchmarks on Project site, referenced to data established by survey control points.
 - 1. Record temporary benchmark locations, with horizontal and vertical data, on Project Record Drawings.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

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- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by the Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use only products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces and assemblies to their original condition.

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- B. Existing Warranties: Remove, replace, patch, and repair materials, assemblies, and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 10 00 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping.
 - 2. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Cut or form holes for penetrations accurately to allow for proper sealing. Temporarily cover openings when not in use.
 - 3. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 4. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 5. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 6. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 7. Proceed with patching after construction operations requiring cutting are complete.
- H. Notify District Construction Manager 48 hours prior to closing openings. Allow Inspector to view conditions prior to closing.
- I. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

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1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance. Replace ceiling tiles damaged by cutting and patching work.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- J. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 DISTRICT-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for District's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by District's construction personnel.
 1. Construction Schedule: Inform District of Contractor's preferred construction schedule for District's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify District if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include District's construction personnel at preinstallation conferences covering portions of the Work that are to receive District's work. Attend preinstallation conferences conducted by District's construction personnel if portions of the Work depend on District's construction.

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3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls" and Section 01 74 19 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

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- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 13 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 02 "Quality Requirements , Contractor Laboratory."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.11 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.

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- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 02 41 16 "Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements.
 - 2. Section 02 41 19 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.
 - 3. Section 04 22 00 "Concrete Unit Masonry" for disposal requirements for masonry waste.
 - 4. Section 31 10 00 "Site Clearing" for disposition of waste resulting from site clearing and removal of above - and below-grade improvements.

1.3 DEFINITIONS

- A. Source Separated Recycling Facility (SSRF): A facility that exclusively accepts separated individual commodities for the purpose of recycling; such as metals, paper, wood, and/or inerts such as asphalt and concrete.
- B. Mixed Debris: Includes solid items such as building materials, packaging, and rubble resulting from construction, remodeling, repair, and demolition operations. One mixed debris processing facility is located in San Diego County at EDCO, 6670 Federal Blvd, Lemon Grove, CA 91945, herein referred to as the EDCO Mixed Debris Recycling Facility.
- C. Class III Landfill: A landfill that accepts non-hazardous waste such as household, commercial, and industrial waste.

- D. Administrative Recycling Program: Separation and recovery of paper and beverage containers from both permanent administrative offices and construction site office(s).
- E. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- F. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- G. 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.
- H. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- I. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- J. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Clearly label all recycling containers and list acceptable and unacceptable materials. Deliver recyclable materials to source separated recycling facilities. Facilitate recycling and salvage of materials, including the following as applicable:
 - 1. Demolition Waste:
 - a. Asphalt paving.
 - b. Concrete.
 - c. Concrete reinforcing steel.
 - d. Brick.
 - e. Concrete masonry units.
 - f. Wood studs.
 - g. Wood joists.
 - h. Plywood and oriented strand board.
 - i. Wood paneling.
 - j. Wood trim.
 - k. Structural and miscellaneous steel.
 - l. Rough hardware.
 - m. Roofing.

- n. Insulation.
- o. Doors and frames.
- p. Door hardware.
- q. Windows.
- r. Glazing.
- s. Metal studs.
- t. Gypsum board.
- u. Acoustical tile and panels.
- v. Carpet.
- w. Carpet pad.
- x. Demountable partitions.
- y. Equipment.
- z. Cabinets.
- aa. Plumbing fixtures.
- bb. Piping.
- cc. Supports and hangers.
- dd. Valves.
- ee. Sprinklers.
- ff. Mechanical equipment.
- gg. Refrigerants.
- hh. Electrical conduit.
- ii. Copper wiring.
- jj. Lighting fixtures.
- kk. Lamps.
- ll. Ballasts.
- mm. Electrical devices.
- nn. Switchgear and panelboards.
- oo. Transformers.

2. Construction Waste:

- a. Masonry and CMU.
- b. Lumber.
- c. Wood sheet materials.
- d. Wood trim.
- e. Metals.
- f. Roofing.
- g. Insulation.
- h. Carpet and pad.
- i. Gypsum board.
- j. Piping.
- k. Electrical conduit.
- l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

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DEHESA SCHOOL MODERNIZATION

- 4) Plastic sheet and film.
- 5) Polystyrene packaging.
- 6) Wood crates.
- 7) Plastic pails.

- B. Co-mingled Debris: Direct all co-mingled site tonnage to the EDCO Mixed Debris Processing Facility.

1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 10 days of date established for the Notice to Proceed.

1.6 INFORMATIONAL SUBMITTALS

- A. Contractor Summary Site Debris Diversion Report: Concurrent with each Application for Payment, submit report. Use District Form CSDDR-1, attached at the end of this Section. The Architect will provide an editable version. *Failure to include Report will result in a 10 percent withholding of payment.*
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations.
- E. 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.
- F. 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.
- G. Qualification Data: For Waste Management Coordinator.
- H. Disposal Manifests:
1. Original manifests and receipts acknowledging disposal of all hazardous and non-hazardous waste material from the project showing delivery date, quantity, and appropriate signature of landfill's authorized representative.
 - a. Submit within 30 days of date that material was transported off site.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Waste Management Conference: Prior to commencement of work, conduct conference at Project site. Attendees shall include District Project Manager, Waste Management Coordinator, and Contractor personnel involved in demolition and waste handling. Review methods and procedures related to waste management, including:
 - 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.

1.8 SITE DEBRIS MANAGEMENT PLAN

- A. General: Develop a site debris management plan. Use District Form CSDMP-1, attached at the end of this Section. The District Construction Manager will provide an editable version. Use a separate form for each project phase (land clearing, demolition, construction).
- B. Post approved plan in a prominent location at the Project site and distribute copies to superintendent and all subcontractors.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION****3.1 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 operation, termination, and removal requirements in Section 01 50 00 "Temporary Facilities and Controls."
- 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 the Project site full time during land clearing and demolition phases, and part time as needed during construction phase.

- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 - 1. Distribute waste management plan to everyone concerned within three 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 on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Section 01 50 00 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 FORMS

- A. See following pages.

FORM CSDMP-1
CONTRACTOR SITE DEBRIS MANAGEMENT PLAN (CSDMP)

Complete a separate form for each project phase (i.e. demolition, land clearing, construction)

Project Title:		
Contract or Work Order No.:		
Contractor's Name:		
Street Address:		
City:	State:	Zip:
Phone: ()	Fax: ()	
E-Mail Address:		
Prepared by: (Print Name)		
Date Submitted:		

Reuse, Recycling or Mixed Debris Processing Processes Used

Describe the types of recycling processes or disposal activities used for material generated in the project. Indicate the type of process or activity by number, types of materials, and quantities that are estimated for reuse and recycling below:

- 01 - Reuse of building materials or salvage items on site (i.e. fencing or red clay brick)
- 02 - Salvaging building materials or salvage items at an offsite salvage or re-use center (i.e. lighting, fixtures)
- 03 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch)
- 04 - Recycling source separated materials at an offsite recycling center (i.e. scrap metal or green matls)
- 05 - Recycling commingled loads of C&D matls at EDCO Mixed Debris Recycling Facility
- 06 - Recycling material as Alternative Daily Cover at landfills
- 07 - Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).
- 09 - Other (please describe) _____

Types of Material Generated

Use these codes to indicate the types of material that are estimated to be generated on the project

A = Asphalt C = Concrete 1. M = Metals I = Mixed Inert G = Green Matls
D = Drywall P/C=Paper/Cardboard W/C = Wire/Cable S= Soils (Non Hazardous)
M/C = Miscellaneous Construction Debris R = Reuse/Salvage W = Wood O = Other (describe)

Facilities Used: Provide Name of Facility and Location (City)

Total Truck Loads: Provide Number of Trucks Hauled from Site During Reporting Period

Total Quantities: If scales are available at sites, report in tons. If not, quantify by cubic yards. For salvage/reuse items, quantify by estimated weight (or units). Provide weight slips or load tickets for each load delivered.

SECTION I - RE-USED/RECYCLED MATERIALS

Include all proposed recycling activities for source separated recycling centers.

Type of Material	Type of Activity	Facilities Used/ Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) M	04	ABC Metals, National City	24	355		
a. Source Separated Diversion			0	0	0	0

FORM CSDMP-1 (Continued)
CONTRACTOR SITE DEBRIS MANAGEMENT PLAN (CSDMP)

SECTION II - MIXED DEBRIS PROCESSING MATERIALS						
<i>Include estimates of all debris generated from activities where no source separated recycling will occur.</i>						
Type of Material	Type of Activity	Facilities Used/ Location	Total Truck Loads	2. Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) M/C	5	EDCO Mixed Debris Recycling Facility	2	35		

SECTION III - TOTAL MATERIALS GENERATED EDCO

This section calculates the total materials recycled verses the total materials disposed for mixed debris sent to EDCO

	<i>Tons Recycled (tons x 0.80)</i>	<i>Tons Disposed (tons x 0.20)</i>
a. EDCO		

SECTION IV - CONTRACTOR'S LANDFILL DIVERSION RATE CALCULATION

Add totals from Section I + Section II + Section III

	Tons	Cubic Yards	Other Wt.
a. Materials Re-Used and Recycled (Section I + II + III)			
3. b. EDCO Disposal (Section III)			
c. Total Materials Generated (a. + b. = c.)			
d. Landfill Diversion Rate (a/c = d Tons Only)*			

** Use tons only to calculate recycling percentages: Tons Reused/Recycled/Tons Generated = % Recycled*

Contractor's Comments *(Provide any additional information pertinent to planned reuse, recycling, or disposal activities):*

Notes:

- EDCO will recover 80% of the mixed debris for the purposes of recycling. Therefore, multiply tonnage by 0.80 for tons recycled and multiply tonnage by 0.20 for total project disposal.
- Suggested Conversion Factors: From Cubic Yards to Tons
 - Asphalt: 0.61 (ex. 1000 CY Asphalt = 610 tons. Applies to broken chunks of asphalt)
 - Concrete: 0.93 (ex. 1000 CY Concrete = 930 tons. Applies to broken chunks of concrete)
 - Ferrous Metals: 0.22 (ex. 1000 CY Ferrous Metal = 220 tons)
 - Non-Ferrous Metals: 0.10 (ex. 1000 CY Non-Ferrous Metals = 100 tons)
 - Drywall Scrap: 0.20
 - Wood Scrap: 0.16

Section B: Plan Narrative -- Methods to Ensure Diversion

Describe the method to be used to reuse and recycle (methods shall include one or more of the following: deconstruction to salvage all or most materials generated, selective salvage with source separation, and/or reuse of materials onsite):

Describe methods to be used to provide onsite instruction regarding appropriate separation, handling, recycling, salvage, reuse and return methods to achieve waste reduction goals.

Describe methods to be used to protect materials to be recycled from contamination. Including schedule of regular clean-up, schedule visual inspections of dumpsters and recycling bins to identify potential contamination of materials.

How will materials be stored and how much space will be required?

Describe your administrative recycling program.

FORM CSDDR-1
CONTRACTOR SUMMARY SITE DEBRIS DIVERSION REPORT (CSDDR)

(Submit With Each Progress Payment)

Project Title:						
Contract or Work Order No.:						
Contractor's Name:						
Street Address:						
City:				State:		Zip:
Phone: ()				Fax: ()		
E-Mail Address:						
Prepared by: (Print Name)						
Date Submitted:						
Period Covered:		From:			To:	
Reuse, Recycling or Mixed Debris Processing Processes Used						
Describe the types of recycling processes or disposal activities used for material generated in the project. Indicate the type of process or activity by number, types of materials, and quantities that were recycled or disposed in the sections below:						
01 - Reuse of building materials or salvage items on site (i.e. fencing or red clay brick)						
02 - Salvaging building materials or salvage items at an offsite salvage or re-use center (i.e. lighting, fixtures)						
03 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch)						
04 - Recycling source separated materials at an offsite recycling center (i.e. scrap metal or green matls)						
05 - Recycling commingled loads of C&D matls at EDCO Mixed Debris Recycling Facility						
06 - Recycling material as Alternative Daily Cover at landfills						
07 - Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).						
09 - Other (please describe) _____						
Types of Material Generated						
Use these codes to indicate the types of material that were generated on the project						
A = Asphalt		C = Concrete		M = Metals		I = Mixed Inert
D = Drywall		P/C=Paper/Cardboard		W/C = Wire/Cable		S= Soils (Non Hazardous)
M/C = Miscellaneous Construction Debris		R = Reuse/Salvage		W = Wood		G = Green Matls
						O = Other (describe)
Facilities Used: Provide Name of Facility and Location (City)						
Total Truck Loads: Provide Number of Trucks Hauled from Site During Reporting Period						
Total Quantities: If scales are available at sites, report in tons. If not, quantify by cubic yards. For salvage/reuse items, quantify by estimated weight (or units). Provide weight slips or load tickets for each load delivered.						
SECTION I - RE-USED/RECYCLED MATERIALS						
Include all recycling activities for source separated recycling centers where recycling occurred.						
Type of Material	Type of Activity	Facilities Used/ Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) M	04	ABC Metals, National City	24	355		
a. Source Separated Diversion			0	0	0	0

FORM CSDDR-1 (Continued)
CONTRACTOR SUMMARY SITE DEBRIS DIVERSION REPORT (CSDDR)

SECTION II - MIXED DEBRIS PROCESSING MATERIALS						
<i>Include all debris generating activities for materials that were not sent to source separated recycling facilities.</i>						
Type of Material	Type of Activity	Facilities Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) M/C	05	EDCO Mixed Debris Recycling Facility	2	35		
SECTION III - TOTAL MATERIALS GENERATED EDCO						
<i>This section calculates the total materials recycled verses the total materials disposed for mixed debris sent to EDCO</i>						
		<i>Tons Recycled (tons x 0.80)</i>	<i>Tons Disposed (tons x 0.20)</i>			
a. EDCO						
SECTION IV - CONTRACTOR'S LANDFILL DIVERSION RATE CALCULATION						
<i>Add totals from Section I + Section II</i>						
				Tons	Cubic YD	Other Wt.
a. Materials Re-Used and Recycled (Section I + II + III)				0		
b. EDCO Disposal (Section III)				0		
c. Total Materials Generated (a. + b. = c.)				0		
d. Landfill Diversion Rate (a/c = d Tons Only)*						
<i>* Use tons only to calculate recycling percentages: Tons Reused/Recycled/Tons Generated = % Recycled</i>						
Contractor's Comments (<i>Provide any additional information pertinent to planned reuse, recycling, or disposal activities</i>):						
Notes:						
4. EDCO will recover 80% of the mixed debris for the purposes of recycling. Therefore, multiply tonnage by 0.80 for tons recycled and multiply tonnage by 0.20 for total project disposal.						
5. Suggested Conversion Factors: From Cubic Yards to Tons (Use when scales are not available)						
Asphalt: 0.61 (ex. 1000 CY Asphalt = 610 tons. Applies to broken chunks of asphalt)						
Concrete: 0.93 (ex. 1000 CY Concrete = 930 tons. Applies to broken chunks of concrete)						
Ferrous Metals: 0.22 (ex. 1000 CY Ferrous Metal = 220 tons)						
Non-Ferrous Metals: 0.10 (ex. 1000 CY Non-Ferrous Metals = 100 tons)						
Drywall Scrap: 0.20						
Wood Scrap: 0.16						

END OF SECTION 01 74 19

**SECTION 01 77 00
CLOSEOUT PROCEDURES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. List of Incomplete Items.
 - 4. Warranties.
 - 5. Final cleaning.
 - 6. Repair of the Work.
- B. Related Requirements:
 - 1. Section 01 73 00 "Execution" for progress cleaning of Project site.
 - 2. Section 01 78 23 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 3. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 4. Section 01 79 00 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.3 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.

- B. Contractor's List of Incomplete Items.
- C. Certified List of Incomplete Items: Final submittal at final completion.

1.5 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Certificate of Construction-Phase Commissioning Process Completion.
- D. Field Report: For pest control inspection.
- E. Site Waste Management Summary: Final summary of construction waste management data as specified in Section 01 74 19 "Construction Waste Management and Disposal."

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Submittals Prior to Substantial Completion: Complete the following prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Certificate of Construction-Phase Commissioning Completion: Per Section 01 91 13 General Commissioning.
 - 5. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by District Construction Manager. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each

item and name and number of related Specification Section. Obtain District Construction Manager's signature for receipt of submittals.

6. Submit testing, adjusting, and balancing records.
 7. Submit changeover information related to District's occupancy, use, operation, and maintenance.
- B. Procedures Prior to Substantial Completion: Complete the following prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise District that site is ready for final changeover of permanent locks. District will make final changeover.
 2. Complete startup and testing of systems and equipment.
 3. Complete commissioning requirements.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Advise District of changeover in utility services.
 6. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 7. Complete final cleaning requirements.
 8. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- C. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of seven days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Project Inspector will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.8 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list). Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - a. Certified:
 - 1) Signed and dated by person with authority to represent Contractor.

- 2) Subsequent to 1) above, signed and dated by person with authority to represent Architect.
 2. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 3. Submit pest-control final inspection report.
 4. Instruct District's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of seven days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Project Inspector will either proceed with inspection or notify Contractor of unfulfilled requirements.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit List of Incomplete items in the following format:
 - a. MS Excel electronic file.
 - b. PDF electronic file.
 - c. Three paper copies.

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 - 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with San Diego Air Pollution Control District allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are not planted, mulched, or paved, to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.
 - k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - p. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls" and Section 01 74 19 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

- 1. Operation and maintenance documentation directory manual.
 - 2. Systems and equipment operation manuals.
 - 3. Systems and equipment maintenance manuals.
 - 4. Product maintenance manuals.

- B. Related Requirements:

- 1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Section 01 91 13 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Initial Manual Submittal: Submit draft copy of each manual at least [30] thirty days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.
- C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least [15] fifteen days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within [15] fifteen days of receipt of Architect's comments and prior to commencing demonstration and training.
- D. Delivery Media: Submit operation and maintenance manuals to District Construction Manager in the following media:
 1. Submit on digital media acceptable to District Project Manager by email. Enable reviewer comments on draft submittals.
 2. Submit one paper copy.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

- a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.6 COMMON REQUIREMENTS FOR OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
 1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of District.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for District Construction Manager.
 7. Name and contact information for Architect.
 8. Name and contact information for Commissioning Authority.

9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."
- F. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- G. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Do not use original project record documents as part of operation and maintenance manuals.
- 1.7 SYSTEMS AND EQUIPMENT OPERATION MANUALS
- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by District's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- D. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

- F. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

1.8 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by District's operating personnel.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.
- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.

- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

1.9 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.

- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION (Not Used)****END OF SECTION 01 78 23**

SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 01 73 00 "Execution" for final property survey.
 - 2. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
 - 3. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Submit one electronic copy of marked-up record prints (Bluebeam software acceptable).
- B. Record Specifications: Submit one electronic copy of marked-up record specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one electronic copy of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Construction Waste Management Plan: Submit one electronic copy of construction waste management plan and a final summary of construction waste management data as specified in Section 01 74 19 "Construction Waste Management and Disposal."

- E. Commissioning Report: Submit one electronic copy of the commissioning report as specified in Section 01 91 13 "General Commissioning Requirements."
- F. C-WPCP, Post-Constructions BMPs: Submit one electronic copy of all record documents specified in Section 01 57 23 "Temporary Storm Water Pollution Control."

1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued, depicting the current status of the Work.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - 2. Content: Types of items requiring marking include:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order, Construction Change Directive, or Field Work Order.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 - o. Changes made by responses to Requests for Information (RFI's).
 - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 - 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, allowances applied, and similar identification, where applicable.

1.5 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Note related Change Orders where applicable.

1.6 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Note related Change Orders where applicable.

1.7 RECORDING AND MAINTENANCE

- A. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's, Project Inspector's, and District Construction Manager's reference during normal working hours.
- B. Review Record Documents weekly with Project Inspector. Indicate to Project Inspector the items incorporated in Project Record Documents concurrent with progress of the Work, including modifications, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 39

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing District's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training video recordings.
- B. Related Requirements:
 - 1. Divisions 2 through 33 Sections for specific requirements for demonstration and training of products and systems in those Sections.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For **[facilitator]** **[instructor]** **[videographer]**.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of videographer.
 - c. Name of Architect.
 - d. Name of District Construction Manager.
 - e. Name of Contractor.
 - f. Names of Contractor Construction Manager, Project Manager, and Superintendent.
 - g. Date of video recording.
 - 2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
 - 3. At completion of training, submit complete training manual(s) for District's use in PDF electronic file format.

1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to demonstration and training including:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

- A. Coordinate instruction schedule with District's operations. Adjust schedule as required to minimize disrupting District's operations and to ensure availability of District's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed by Architect.

1.7 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Systems and equipment operation manuals.
 - c. Systems and equipment maintenance manuals.
 - d. Product maintenance manuals.
 - e. Project record documents.
 - f. Identification systems.
 - g. Warranties and bonds.
 - h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning.
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:

- a. Diagnosis instructions.
- b. Repair instructions.
- c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
- d. Instructions for identifying parts and components.
- e. Review of spare parts needed for operation and maintenance.

1.8 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.9 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and District for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct District's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. District will furnish a representative to describe District's operational philosophy.
 - 2. District will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide instruction addressing seasonal operations variations.
 - 1. Schedule training with District, through District Construction Manager, with at least seven days' advance notice.
- D. Training Location: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. When necessary, provide classroom training.
 - 1. Webinar training is not acceptable.
- E. Reference Material: Conduct training using final operation and maintenance data submittals.
- F. Cleanup: Collect used and leftover educational materials and give to District. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.10 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Digital Video Recordings: Provide high-resolution, color digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode[**with vibration reduction technology**].
 - 1. Submit video recordings on thumb drive.
 - 2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
 - 3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
 - 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training thumb drive that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
 - a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. E-mail address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
 - 1. Film training session(s) in segments not to exceed 15 minutes.
 - a. Produce segments to present a single significant piece of equipment per segment.
 - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
 - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
 - 1. Furnish additional portable lighting as required.

- E. Narration: Describe scenes on video recording by audio narration. Include description of items being viewed.
- F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
- G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION (Not Used)****END OF SECTION 01 79 00**

SECTION 01 91 13**GENERAL COMMISSIONING REQUIREMENTS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY**A. Section Includes:**

1. General requirements for coordinating and scheduling commissioning (Cx) activities.
2. Cx team member responsibilities
3. Cx meetings.
4. Cx reports.
5. Use of Cx process test equipment, instrumentation, and tools.
6. Pre-Functional Checklists, including installation checks, startup, performance tests, and performance test demonstration.
7. Cx tests and Cx test demonstration.
8. Adjusting, verifying, and documenting identified systems and assemblies.

B. Related Requirements:

1. Section 01 10 00 "Summary" for Commissioning Authority (CxA) responsibilities.
2. Section 01 33 00 "Submittal Procedures" for submittal procedure requirements for Cx process.
3. Section 01 77 00 "Closeout Procedures" for Certificate of Construction-Phase Cx Process Completion submittal requirements.
4. Section 01 78 23 "Operation and Maintenance Data" for preliminary operation and maintenance (O&M) data submittal requirements.
5. Section 23 08 00 "Commissioning of HVAC" for technical Cx requirements for HVAC.
6. Section 26 08 00 "Commissioning of Electrical Systems" for technical Cx requirements for electrical systems.

GENERAL COMMISSIONING REQUIREMENTS**01 91 13 - 1****DEHESA SCHOOL MODERNIZATION**

1.3 DEFINITIONS

- A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a Cx activity, including Pre-Functional Checklists, Functional Performance Tests, performance test demonstrations, Cx tests, and Cx test demonstrations.
- B. Commissioning (Cx): A quality-focused process for verifying and documenting that facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with project requirements. Requirements specified here are limited to construction phase Cx activities. Scope of Cx process is defined in Section 01 10 00 "Summary."
- C. Commissioning Authority (CxA): An entity engaged by District, and identified in Section 01 10 00 "Summary," to evaluate Cx process work.
- D. Commissioning (Cx) Coordinator: A person or entity employed by Contractor to manage, schedule, and coordinate Cx Process.
- E. Commissioning (Cx) Plan: A document, prepared by CxA, that outlines organization, schedule, allocation of resources, and documentation of Cx requirements.
- F. Commissioning (Cx) Tracking Matrix: Cx record of submittals reviewed, PFC and FPT development, TAB verification results, PFC completion status, training status, O&M approval, and FPTs results.
- G. Construction-Phase Cx Process Completion: Stage of completion and acceptance of Cx process when resolution of deficient conditions and issues discovered during Cx process and retesting until acceptable results are obtained has been accomplished. District will establish in writing the date construction-phase Cx process completion is achieved. See Section 01 77 00 "Closeout Procedures" for Certificate of Construction-Phase Cx Process Completion submittal requirements.
 - 1. Cx process is complete when Cx work specified in this Section and related Sections has been completed and accepted, including:
 - a. Completion of tests and acceptance of test results
 - b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
 - c. Written plan for resolution of open issues to be completed within [30] thirty days.
 - d. Comply with requirements in Section 01 79 00 "Demonstration and Training."
 - e. Completion and acceptance of submittals and reports referenced in this and related commissioning sections.
- H. District's Witness
 - 1. As determined by District Project Manager.

2. CxA, District Construction Manager, or Architect-designated witness, authorized to authenticate test demonstration data and to sign completed test data forms.
 - I. Functional Performance Test (FPT): Testing of installed building assemblies, components, equipment, systems and interfaces facilitated by CxA and performed by Contractor which confirms correct performance through all operating modes and compliance with Contract Documents, manufacturer's recommendations and project requirements.
 - J. Physical Plant Operations (PPO): Manages operation and maintenance (O&M) of District facilities and equipment.
 - K. Pre-Functional Checklists (PFC): Quality control verification checklists performed by installer as building assemblies, components, equipment and systems are being installed that documents that the materials, installation procedures, interfaces with other trades, start-up, testing and operations are correct, complete, in compliance with Contract Documents and manufacturer's recommendations and are ready for FPTs.
 - L. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.
 - M. Systems Manual: Provides information needed to understand, operate, and maintain equipment and systems. Includes site information, description of major systems, instructions for basic O&M, including general site operating procedures, basic troubleshooting, recommended maintenance requirements, and site events log, site equipment inventory and maintenance notes.
 - N. Test: FPTs, performance test demonstrations, Cx tests, and Cx test demonstrations.
 - O. TAB: Testing, adjusting, and balancing systems and equipment.
- 1.4 COMMISSIONING (Cx) TEAM
- A. Members Appointed by Contractor(s):

Per Section 01 31 00 Project Management and Coordination, DEFINITIONS article, "District Construction Manager is General Contractor's sole point of contact for all communications with District. Direct all District communications to District Construction Manager. District Construction Manager will disseminate communications to appropriate District personnel as necessary." Communications with Contractor must be conveyed by District Construction Manager, even when recommendations originate with CxA.

1. Cx Coordinator.
2. Project superintendent and other employees that Contractor may deem appropriate for a particular portion of the Cx process.
3. Subcontractors, installers, suppliers, and specialists that Contractor may deem appropriate for a particular portion of the Cx process.

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4. Appointed team members shall have the authority to act on behalf of the entity they represent.
- B. Members Appointed by District:
1. CxA, plus consultants that CxA may deem appropriate for a particular portion of Cx process.
 2. District representative(s), facility O&M personnel, plus other employees, separate contractors, and consultants that District may deem appropriate for a particular portion of Cx process.
 3. Architect, plus employees and consultants that Architect may deem appropriate for a particular portion of Cx process.
- C. Duties of District Construction Manager
1. Facilitate coordination of Cx work by CxA.
 2. With District Representative as applies and CxA, ensure that Cx activities are being included into Contractor's accepted baseline schedule with appropriate durations and linking of predecessor and successor activities. A list of Cx activities for inclusion is provided in Cx Plan.
 3. Review and approve Cx Plans and procedures as developed by CxA.
 4. Participate in Cx kick-off meeting and other Cx team meetings.
 5. Provide CxA with copies or access to construction documents, addenda, change orders, approved submittals and shop drawings relating to commissioned equipment.
 6. Arrange for PPO facility O&M personnel to participate in various Cx team activities (e.g., Cx testing and training sessions).
 7. Review and approve PFCs and Functional Performance Test procedures submitted by CxA, prior to testing.
 8. Review Cx progress and deficiency reports.
 9. Identify District O&M staff and contractor O&M personnel required to participate in training, and schedule training with District PPO Coordinator.
- D. Duties of Commissioning Authority (CxA)
1. Organize and lead Cx team.
 2. Work with District Construction Manager and Contractor to help integrate Cx activities into Contractor's accepted baseline schedule.
 3. Develop and revise Cx Plan with input from Cx team, as necessary.
 4. Conduct Cx kick-off meeting with Cx team.
 5. Conduct and document periodic Cx coordination meetings. Cx coordination meetings are generally held more frequently prior to and during testing phase of Cx process.
 6. Review and comment on construction documents, addenda, change orders, RFI's, submittals, and shop drawings relating to systems being commissioned as required by District Construction Manager.
 7. Review and recommend revisions or approval, as applicable, of Contractor Start-up Plans (provided by Contractor). Spot check a sampling of start-up plans completed by Contractors to verify compliance.

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8. Develop system level Pre-Functional Checklists using information provided by Contractor (i.e. submittals, preliminary O&M data, start-up and checkout procedures) and distribute for Contractor use.
9. Develop FPT procedures using approved submittals (i.e. equipment submittals, preliminary O&M data, control shop drawings) with input from Cx team (including Contractor).
10. Conduct periodic site visits to observe component and system installation. Provide Cx observation report to District after each site visit.
11. Spot check a sampling of PFCs completed by Contractors to verify compliance with contract requirements.
12. Perform testing, adjusting, and balancing (TAB) verification based on scope of TAB activities for this project as required in Section 23 05 93 "Testing, Adjusting, and Balancing".
13. Analyze any applicable performance trending logs and monitoring data to verify performance.
14. Direct and witness complete functional testing as defined in Cx Plan and Functional Test Procedures. All testing shall be performed by Contractor and documented by CxA. Witness and verify satisfactory completion of equipment and system tests and inter-systems FPT.
15. Maintain Cx Tracking Matrix.
16. Provide a complete record of all completed PFCs and FPTs to District for review and acceptance.
17. Review, comment and recommend approval of Contractor-provided training plan outlines, detailed training plans, agendas, materials and evaluations.
18. Review, comment and recommend approval of O&M Manuals submitted by Contractor.
19. Witness training of District O&M personnel.
20. Prepare Systems Manual.
21. Prepare Final Cx Report.
22. Witness execution of any seasonal or deferred testing and deficiency correction, as applicable.

E. Duties of Design Team

1. Provide clarifications to design intent as well as operation and control of commissioned systems in areas where specifications, control drawings or equipment documentation are not sufficient for writing detailed testing procedures.
2. Collaborate with CxA on Submittal Reviews and ensure Cx review comments are evaluated.
3. Participate in Cx issue resolutions and coordination meetings as requested by CxA and District.
4. Review and comment on PFCs and FPTs developed by CxA to ensure that designer's intent for functionality has been properly interpreted.
5. Evaluate results and conclusions from Cx process.

F. Duties of Contractor

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1. Assign a representative to Cx team with authority to make decisions on behalf of Contractor as related to Cx process.
2. Ensure subcontractor representatives on Cx team have authority to make decisions on behalf of their respective firms as related to Cx process.
3. Facilitate coordination of Cx work. Ensure activities are being scheduled into Contractor's accepted baseline schedule with appropriate durations and linking of predecessor and successor activities. An example list of Cx activities for inclusion is provided in Cx Plan.
4. Include costs for Cx activities in contract price.
5. Provide responses to comments received on work products (e.g., installation tests, TAB plan and procedures, start-up testing plans, O&M manuals, training plans) by CxA and other Cx team members.
6. Provide information required for development of a complete Cx Plan, PFCs, and functional tests to CxA.
7. Attend Cx kick-off meeting and other Cx meetings, as necessary and as requested by other Cx Team members. Ensure timely response and follow up to issues arising from these meetings.
8. Review and comment on Pre-Functional Checklists, FPTs and Cx Plan to assure they are applicable to demonstrate functional performance, can actually be performed, will not damage equipment, and will not void equipment warranty.
9. Prepare specific training plans, agendas and presentation materials in accordance with related sections.
10. Execute and document completion of start-up and checkout plans and PFCs.
11. Prepare and maintain an updated detailed Cx testing schedule.
12. Provide equipment and personnel required to execute PFCs and FPTs.
13. Execute FPTs as coordinated by CxA.
14. Duties of Installing Contractors
 - a. Operate their installed equipment and systems during tests
 - b. Assist with tests of interfacing equipment and systems, as needed.
15. Resolve Cx issues in a timely manner and prior to Final Completion. Notify Cx team of corrective actions taken.
16. Coordinate, schedule and conduct training for operations personnel.
17. Submit complete O&M information and record drawings to CxA for review of compliance with Contract Documents.
18. Support seasonal or deferred testing requirements.

G. Duties of Cx Coordinator

1. Management and Coordination: Manage, schedule, and coordinate Cx process, including;
 - a. Coordinate with subcontractors on their Cx responsibilities and activities.
 - b. Obtain, assemble, and submit Cx documentation.
- Coordinate first subparagraph below with Section 01 31 00 "Project Management and Coordination."
- c. **[Attend] [Conduct]** periodic on-site Cx meetings. Comply with requirements in Section 01 31 00 "Project Management and Coordination."

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- d. Develop and maintain Cx schedule. Integrate Cx schedule into accepted Construction Schedule. Update Construction Schedule at specified intervals.
- e. Review and comment on preliminary test procedures and data forms.
- f. Report inconsistencies and issues in system operations.
- g. Verify that tests have been completed and results comply with acceptance criteria, and that equipment and systems are ready before scheduling test demonstrations.
- h. Direct and coordinate test demonstrations.
- i. Coordinate witnessing of test demonstrations by District witness.
- j. Coordinate and manage training. Be present during training sessions to direct video recording, present training, and direct training presentations of others. Comply with requirements in Section 01 79 00 "Demonstration and Training."
- k. Prepare and submit specified Cx reports.
- l. Track Cx issues until resolution and retesting is successfully completed.
- m. Retain original records of Cx process work, organized as required for Cx report. Provide District representative access to these records on request.
- n. Assemble and submit Cx report.

H. Duties of Manufacturers

- 1. Provide all information required for O&M of system or assembly as part of submittal.
- 2. Provide requirements to maintain warranty as part of submittal.
- 3. Coordinate and accomplish factory tests.
- 4. Provide training.
- 5. Demonstrate operation and performance of system or assembly.

1.5 INFORMATIONAL SUBMITTALS

- A. Comply with requirements in Section 01 33 00 "Submittal Procedures" for submittal procedure general requirements for Cx process.
- B. Cx Plan Information:
 - 1. List of Contractor-appointed Cx team members to include specific personnel and subcontractors performing various Cx requirements.
 - 2. Schedule of Cx activities, integrated with Construction Schedule. Comply with requirements in Section [01 32 01] [01 32 02] [01 32 03] [01 32 04] "Construction Progress Documentation" for Construction Schedule general requirements as they relate to Cx process.
 - 3. Contractor personnel and subcontractors participating in each test.
 - 4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.
- C. Cx schedule, including two-week look-ahead Cx schedules as specified in Part 3.

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D. Cx Coordinator Letter of Authority:

1. Within 10 days after approval of Cx Coordinator qualifications, submit a letter of authority for Cx Coordinator, signed by a principal of Contractor's firm. Letter shall authorize Cx Coordinator to do the following:
 - a. Make inspections required for Cx process.
 - b. Coordinate, schedule, and manage Cx process of Contractor, subcontractors, and suppliers.
 - c. Obtain documentation required for Cx process from Contractor, subcontractors, and suppliers.
 - d. Report issues, delayed resolution of issues, schedule conflicts, and lack of cooperation or expertise of Cx team.

E. Cx Coordinator Qualification Data: For entity coordinating Contractor's Cx activities to demonstrate their capabilities and experience.

1. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

F. List test instrumentation, equipment, and monitoring devices. Include:

1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.
2. Brief description of intended use.
3. Calibration record showing:
 - a. Calibration agency, including name and contact information.
 - b. Last date of calibration.
 - c. Range of values for which calibration is valid.
 - d. Certification of accuracy.
 - e. Certification for calibration equipment traceable to NIST.
 - f. Due date of next calibration.

G. Test Reports:

1. Pre-Startup Report: Prior to startup of equipment or a system, submit completed PFCs.
2. Test Data Reports: At end of each day in which tests are conducted, submit test data for tests performed.
3. Cx Issue Reports: Daily, at end of each day in which tests are conducted, submit Cx issue reports for tests for which acceptable results were not achieved.
4. Weekly Progress Report: Weekly, at end of each week in which tests are conducted, submit a progress report.
5. Data Trend Logs: Submit data trend logs at end of trend log period.

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H. PFCs:

1. Material checks.
2. Installation checks.
3. Startup procedures, where required.

1.6 CLOSEOUT SUBMITTALS**A. Cx Report:**

1. At Construction-Phase Cx Completion, include:
 - a. Pre-startup reports.
 - b. PFCs completed and signed.
 - c. FPTs completed and signed.
 - d. Progress reports.
 - e. Cx issue report log.
 - f. Cx Tracking Matrix.
 - g. Meeting Minutes.
 - h. Test & Balance Reports.
 - i. Cx issue reports showing resolution of issues.
 - j. Correspondence or other documents related to resolution of issues.
 - k. Agreed upon plan for resolution of open issues.
 - l. Other reports required by Cx process.
 - m. List unresolved issues and reasons they remain unresolved and should be exempted from requirements for Construction-Phase Cx Completion.
 - n. Report shall include Cx work of Contractor.

B. Request for Certificate of Construction-Phase Cx Process Completion.**C. O&M Data: For proprietary test equipment, instrumentation, and tools to include in O&M manuals.****PART 2 - PRODUCTS****2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS**

- A. Test equipment and instrumentation required to perform Cx process shall remain property of Contractor unless otherwise indicated.
- B. Test equipment and instrumentation required to perform Cx process shall comply with:
 1. Be manufactured for purpose of testing and measuring tests for which they are being used and have an accuracy to test and measure system performance within tolerances required to determine acceptable performance.
 2. Calibrated and certified.

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- a. Calibration performed and documented by a qualified calibration agency according to national standards applicable to tools and instrumentation being calibrated. Calibration shall be current according to national standards or within test equipment and instrumentation manufacturer's recommended intervals, whichever is more frequent, but not less than within six months of initial use on Project. Calibration tags shall be permanently affixed.
 - b. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.
3. Maintain test equipment and instrumentation.
4. Use test equipment and instrumentation only for testing or monitoring Work for which they are designed.

2.2 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

- A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate, or perform work on its equipment.
 1. Identify proprietary test equipment, instrumentation, and tools required in test equipment identification list submittal.

2.3 REPORT FORMAT AND ORGANIZATION

- A. General Format and Organization:

Retain two subparagraphs below for projects requiring electronic submittals; delete for projects requiring only hard-copy submittals.

1. Record report on USB thumb drive.
 2. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.
- B. Cx Report:
 1. Include a table of contents and an index to each test.
 2. Include major tabs for each specification section.
 3. Include minor tabs for each test.
 4. Within each minor tab, include:
 - a. Test specification.
 - b. Pre-startup reports.
 - c. Test data forms, PFCs completed and signed.
 - d. FPTs completed and signed.

- e. Cx issue reports, showing resolution of issues, and documentation related to resolution of issues pertaining to a single test. Group data forms, Cx issue reports showing resolution of issues, and documentation related to resolution of issues for each test repetition together within minor tab, in reverse chronological order (most recent on top).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Review preliminary PFCs and preliminary FPT procedures and data forms.

3.2 PRE-FUNCTIONAL CHECKLISTS (PFCs)

Include in PFCs applicable contract requirements, manufacturer's standard installation requirements, issues that impact ability of installation to comply with test acceptance criteria, and issues that impede safe access for testing, maintenance, operation and replacement, at minimum.

- A. Checklists-Functional Checklists cannot modify or conflict with Contract Documents.
- B. Create PFCs based on actual systems and equipment to be included in Project.
- C. Material Checks: Compare specified characteristics and approved submittals with materials as received. Include factory tests and other evaluations, adjustments, and tests performed prior to shipment if applicable.
 - 1. Service connection requirements, including configuration, size, location, and other pertinent characteristics.
 - 2. Included optional features.
 - 3. Inspect and record physical condition of materials and equipment, including agreement with approved submittals, cleanliness, and lack of damage.
 - 4. Installation Checks:
 - a. Location according to Drawings and approved Shop Drawings.
 - b. Configuration.
 - c. Compliance with manufacturers' written installation instructions.
 - d. Attachment to structure.
 - e. Access clearance to allow for maintenance, service, repair, removal, and replacement without need to disassemble or remove other equipment or building elements. Access coordinated with other building elements and equipment, including ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.
 - f. Utility connections are of correct characteristics, as applicable.
 - g. Correct labeling and identification.

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- h. Startup Checks: Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.
- D. Startup: Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, at minimum. Use of manufacturer provided start-up form is acceptable.
- E. Deferred PFCs: Obtain District approval of proposed deferral of PFCs, including proposed schedule of completion of each deferred PFC, before submitting request for Certificate of Construction-Phase Cx Process Completion. When approved, deferred PFCs may be completed after date of Construction-Phase Cx Completion. Include in request for Certificate of Construction-Phase Cx Process Completion:
 - 1. Identify deferred PFCs by number and title.
 - 2. Provide a target schedule for completion of deferred PFCs.
 - 3. Written approval of proposed deferred PFCs , including approved schedule of completion of each deferred PFC.
- F. Delayed PFCs: Obtain District approval of proposed delayed PFCs, including proposed schedule of completion of each delayed PFC, before submitting request for Certificate of Construction-Phase Cx Process Completion. When approved, delayed PFCs may be completed after date of Construction-Phase Cx Completion. Include in request for Certificate of Construction-Phase Cx Process Completion:
 - 1. Identify delayed PFC by PFC number and title.
 - 2. Provide a target schedule for completion of delayed PFCs.
 - 3. Written approval of proposed delayed PFCs, including approved schedule of completion of each delayed PFC.

3.3 GENERAL EXECUTION REQUIREMENTS

- A. Schedule and coordinate Cx process with Contractor's accepted Construction Schedule.
- B. Perform activities identified in PFCs including tests, and document results of actions as construction proceeds.
- C. Perform test demonstrations for DistrictCxA. Unless otherwise indicated, demonstrate tests for 100 percent of work to which test applies.
- D. Report test data and Cx issue resolutions.
- E. Schedule personnel to participate in and perform Cx process work.

3.4 COMMISSIONING (Cx) TESTING

- A. Quality Control: PFCs, including FPTs, are quality-control tools designed to improve functional quality of Project. Test demonstrations evaluate effectiveness of Contractor's quality-control process.
- B. CxA will be present to witness Cx work requiring signature of a District witness, including test demonstrations.
- C. Provide sufficient notice, regarding their completion schedule for PFCs and startup of all equipment and systems to allow FPTs to be scheduled. Cx team shall oversee, witness, and document performance all equipment and systems. CxA in association with contractor/subcontractors and facility staff shall execute tests. FPTs shall be conducted after PFCs, and startup has been satisfactorily completed. Control system shall be sufficiently tested and approved by CxA before it is used, to verify performance of other components or systems. Air balancing and water balancing shall be completed before FPTs of air or water-related equipment or systems. Testing proceeds from components to sub-systems to systems. When proper performance of all interacting individual systems has been achieved, interface or coordinated responses between systems shall be checked.
- D. Pre-Functional Checklists (PFCs):
 - 1. Complete PFCs as Work is completed.
 - 2. Distribute PFCs to installing contractors before they start work.
 - 3. Installers:
 - a. Verify installation using approved Pre-Functional Checklist as Work is completed.
 - b. Complete and sign PFC as work is completed on a weekly basis for work performed during preceding week.
 - 4. Provide Cx Authority access to PFCs.
- E. Installation Compliance Issues: Record as an installation compliance issue work found to be incomplete, inaccessible, at variance with Contract Documents, nonfunctional, or that does not comply with PFCs. Record installation compliance issues on PFC at time they are identified. Record corrective action and how future Work should be modified before signing off PFC.
- F. Pre-Startup Audit: Prior to executing startup procedures, review completed installation checks to determine readiness for startup and operation. Report conditions, which, if left uncorrected, adversely impact ability of systems or equipment to operate satisfactorily or to comply with acceptance criteria. Prepare pre-startup report for each system.
- G. FPT Procedures and Test Data Forms:

1. Test procedures shall define step-by-step procedures to be used to execute FPTs and test demonstrations.
2. Test procedures shall be specific to make, model, and application of equipment and systems being tested.
3. Completed test data forms are official records of test results.
4. CxA will provide to Contractor preliminary PFCs and FPT Procedures after approval of Product Data, Shop Drawings, and preliminary O&M manual.
5. Review preliminary test procedures and test data forms, and provide comments within 14 days of receipt from CxA. Review shall address:
 - a. Equipment protection and warranty issues, including manufacturers' installation and startup recommendations, and O&M instructions.
 - b. Applicability of procedure to specific software, equipment, and systems approved for installation.
6. After Contractor has reviewed and commented on preliminary test procedures and test data forms, CxA will revise and reissue approved revised test procedures and test data forms marked "Approved for Testing."
7. Use only approved test procedures and test data forms marked "Approved for Testing" to perform and document tests and test demonstrations.

H. Performance of Tests:

1. Sampling Rates
 - a. Tests: 100 percent.
 - b. Test demonstrations: 100 percent, unless otherwise indicated.
2. Perform and complete each step of approved test procedures in order listed.
3. Record data observed during performance of tests on approved data forms at time of test performance and when results are observed.
4. Record test results that are not within range of acceptable results on Cx issue report forms in addition to recording results on approved test procedures and data forms according to "Cx Compliance Issues" Paragraph in this Article.
5. On completion of a test, sign completed test procedure and data form. Tests for which test procedures and data forms are incomplete, not signed, or which indicate performance that does not comply with acceptance criteria will be rejected. Tests for which test procedures and data forms are rejected shall be repeated and results resubmitted.
6. Perform tests on a sample of tests after test data submittals are approved.
 - a. Sampling rate for tests: 100 percent, unless otherwise indicated in individual test specification.
7. Notify District witness at least three days in advance of each test.
8. Perform and complete each step of approved test procedures in order listed.
9. Record data observed during performance of test on approved data forms at time of test and when results are observed.

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10. Provide full access to District witness to directly observe performance of all aspects of system response during test. On completion of a test, sign completed data form and obtain signature of District witness at time of test to authenticate reported results.
 11. Test data forms not signed by Contractor and District witness at time of completion of procedure will be rejected. Test for which data forms are rejected shall be repeated and results shall be resubmitted.
 12. False load test requirements are specified in related sections.
 - a. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply specified load to system. False load system shall be capable of steady-state operation and modulation at level of load specified.
- I. Deferred Tests:
1. Deferred Test List: Identify, in request for Certificate of Construction-Phase Cx Process Completion, proposed deferred tests or other tests approved for deferral until specified seasonal or other conditions are available. When approved, deferred tests may be completed after date of Construction-Phase Cx Completion. Identify proposed deferred tests in request for Certificate of Construction-Phase Cx Process Completion as follows:
 - a. Identify deferred tests by number and title.
 - b. Provide a target schedule for completion of deferred tests.
 2. Schedule and coordinate deferred tests. Schedule deferred tests when specified conditions are available. Notify District Construction Manager, Architect and CxA at least three working days (minimum) in advance of tests.
 3. Where deferred tests are specified, coordinate participation of necessary personnel and of Architect, CxA, and District witness. Schedule deferred tests to minimize occupant and facility impact. Obtain Architect's approval of proposed schedule.
- J. Delayed Tests:
1. Delayed Test List: Identify, in request for Certificate of Construction-Phase Cx Process Completion, proposed delayed tests. Obtain District approval of proposed delayed tests, including proposed schedule of completion of each delayed test, before submitting request for Certificate of Construction-Phase Cx Process Completion. Include following in request for Certificate of Construction-Phase Cx Process Completion:
 - a. Identify delayed tests by test number and title.
 - b. Written approval of proposed delayed tests, including approved schedule of completion of delayed tests.

2. Schedule and coordinate delayed tests. Schedule delayed tests when conditions that caused delay have been rectified. Notify District Construction Manager, Architect and CxA at least three working days (minimum) in advance of tests.
3. Where delayed tests are approved, coordinate participation of necessary personnel and of Architect, CxA, and District witness. Schedule delayed tests to minimize occupant and facility impact. Obtain Architect's approval of proposed schedule.

K. Commissioning (Cx) Compliance Issues:

1. Test results that are not within range of acceptable results are Cx compliance issues.
2. Track and report Cx compliance issues until resolution and retesting are successfully completed.
3. If a test fails, determine cause of failure. Direct timely resolution of issue and then repeat demonstration. If a test demonstration must be repeated due to failure caused by Contractor work or materials, reimburse District for billed costs for participation in repeated demonstration.
4. Test Results: If a test demonstration fails to meet acceptance criteria, perform the following:
 - a. Complete a Cx compliance issue report form promptly on discovery of test results that do not comply with acceptance criteria.
 - b. Submit Cx compliance issue report form within 72 hours of test.
 - c. Determine cause of failure.
 - d. Establish responsibility for corrective action if failure is due to conditions found to be Contractor's responsibility.
5. Cx Compliance Issue Report: Provide a Cx compliance issue report for each issue. Do not report multiple issues on same Cx compliance issue report.
 - a. Exception: If an entire class of devices is determined to exhibit identical issue, they may be reported on a single Cx compliance issue report. (For example, if all return-air damper actuators that are specified to fail to open position are found to fail to closed position, they may be reported on a single Cx issue report. If a single Cx issue report is used for multiple Cx compliance issues, each device shall be identified in report, and total number of devices at issue shall be identified.
 - b. Complete and submit Part 1 of Cx compliance issue report immediately when condition is observed.
 - c. Record Cx compliance issue report number and describe deficient condition on data form.
 - d. Resolve Cx compliance issues promptly. Complete and submit Part 2 of Cx compliance issue report when issues are resolved.
6. Diagnose and correct failed test as follows:
 - a. Perform diagnostic tests and activities required to determine fundamental cause of issues observed.

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- b. Record each step of diagnostic procedure prior to performing procedure. Update written procedure as changes become necessary.
 - c. Record results of each step of diagnostic procedure.
 - d. Record conclusion of diagnostic procedure on fundamental cause of issue.
 - e. Determine and record corrective measures.
 - f. Include diagnosis of fundamental cause of issues in Cx compliance issue report.
- 7. Retest:
 - a. Schedule and repeat complete test procedure for each test demonstration for which acceptable results are not achieved. Obtain signature of District witness on retest data forms. Repeat test demonstration until acceptable results are achieved. Except for issues that are determined to result from design errors or omissions, or other conditions beyond Contractor's responsibility, compensate District for direct costs incurred as result of repeated test demonstrations to achieve acceptable results.
 - b. For each repeated test demonstration, submit a new test data form, marked "Retest."
- 8. Do not correct Cx compliance issues during test.
 - a. Exceptions will be allowed if cause of issue is obvious and resolution can be completed in a reasonable amount time. If corrections are made under this exception, note deficient conditions on test data form and issue a Cx compliance issue report. A new test data form, marked "Retest," shall be initiated after resolution has been completed.

3.5 COMMISSIONING (Cx) MEETINGS

- A. **[Schedule and conduct] [CxA will schedule and conduct]** Cx meetings. Comply with requirements in Section 01 31 00 "Project Management and Coordination".

3.6 SEQUENCING

- A. Sequencing of Cx Verification Activities: For a particular material, item of equipment, assembly, or system, perform following in order listed unless otherwise indicated:
 - 1. Pre-Functional Checklists (PFCs):
 - a. Material checks.
 - b. Installation checks.
 - c. Startup, as appropriate. Some startup may depend on component performance. Such startup may follow component performance tests on which startup depends.
 - d. Performance Tests:

- 1) Static tests, as appropriate.
- 2) Component performance tests. Some component performance tests may depend on completion of startup. Such component performance tests may follow startup.
- 3) Equipment and assembly performance tests.
- 4) System performance tests.

2. Functional Performance Tests.

- B. Before performing FPTs, verify that materials, equipment, assemblies, and systems are delivered, installed, started, and adjusted to perform according to PFCs.
- C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing FPT demonstrations. Notify Construction Manager if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.
- D. Commence FPTs as soon as installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided incomplete work does not interfere with successful execution of test.

3.7 SCHEDULING

- A. Commence Cx process as early in construction period as possible.
- B. Cx Schedule: Integrate Cx activities into Contractor's accepted Construction Schedule. See Section [01 32 01] [01 32 02] [01 32 03] [01 32 04] "Construction Progress Documentation."
 1. Include detailed Cx activities in monthly updated Construction Schedule and short-interval schedule submittals.
 2. Schedule start date and duration for following Cx activities:
 - a. Submittals.
 - b. Preliminary O&M manual submittals.
 - c. Installation checks.
 - d. Startup, where required.
 - e. FPTs.
 - f. .
 3. Schedule shall include a line item for each installation check, startup, and test activity specific to equipment or systems involved.
 4. Determine milestones and prerequisites for Cx process. Show Cx milestones, prerequisites, and dependencies in monthly updated critical-path-method construction schedule and short-interval schedule submittals
 5. Provide estimated date of construction-phase Cx process completion.

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C. Two-Week Look-Ahead Commissioning (Cx) Schedule:

1. Two weeks prior to beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for duration of Cx process.
2. Two-week look-ahead schedules shall identify date, time, beginning location, Contractor personnel required, and anticipated duration for each startup or test activity.
3. Use two-week look-ahead schedules to notify and coordinate participation of District witnesses.

D. District Witness Coordination:

1. Coordinate CxA's witness participation District Construction Manager.
2. Notify District Construction Manager of Cx schedule changes at least [**two**] **<Insert number>** work days in advance for activities requiring participation of District witness.

3.8 COMMISSIONING (Cx) REPORTS

A. Test Reports:

1. Pre-startup reports include observations of conditions of installation, organized into following sections:
 - a. Equipment Model Verification: Compare contract requirements, approved submittals, and provided equipment. Note inconsistencies.
 - b. Preinstallation Physical Condition Checks: Observe physical condition of equipment prior to installation. Note conditions including physical damage, corrosion, water damage, or other contamination or dirt.
 - c. Preinstallation Component Verification Checks: Verify components supplied with equipment, preinstalled or field installed, are correctly installed and functional. Verify external components required for proper operation of equipment correctly installed and functional. Note missing, improperly configured, improperly installed, or nonfunctional components.
 - d. Summary of Installation Compliance Issues and Corrective Actions: Identify installation compliance issues and corrective actions for each. Verify that issues noted have been corrected.
 - e. Evaluation of System Readiness for Startup: For each item of equipment for each system for which startup is anticipated, document in summary form acceptable to District completion of equipment model verification, preinstallation physical condition checks, preinstallation component verification checks, and completion of corrective actions for installation compliance issues.
2. FPT data reports include:

- a. "As-tested" system configuration. Complete record of conditions under which test was performed, including status of equipment, systems, and assemblies; temporary adjustments and settings; and ambient conditions.
 - b. Data and observations, including data trend logs, recorded during tests.
 - c. Signatures of individuals performing and witnessing tests.
 - d. Data trend logs accumulated overnight from previous day of testing, if applicable.
3. Commissioning (Cx) Compliance Issue Reports: Report as Cx compliance issues results of tests and test demonstrations that do not comply with acceptance criteria. Report only one issue per Cx compliance issue report. Use sequentially numbered facsimiles of Cx compliance issue report form included in this Section, or other form approved by District. Distribute Cx compliance issue reports to parties responsible for taking corrective action. Identify:
 - a. Cx compliance issue report number. Assign unique, sequential numbers to individual Cx compliance issue reports when they are created, to be used for tracking.
 - b. Action distribution list.
 - c. Report date.
 - d. Test number and description.
 - e. Equipment identification and location.
 - f. Briefly describe observations about performance associated with failure to achieve acceptable results. Identify cause of failure if apparent.
 - g. Diagnostic procedure or plan to determine cause (include in initial submittal)
 - h. Diagnosis of fundamental cause of issues as specified below (include in resubmittal).
 - i. Fundamental cause of unacceptable performance as determined by diagnostic tests and activities.
 - j. When issues have been resolved, update and resubmit Cx issue report forms by completing Part 2. Identify resolution taken and dates and initials of persons making entries.
 - k. Schedule for retesting.
4. Weekly progress reports include information for tests conducted since preceding report and:
 - a. Completed data forms.
 - b. Equipment or system tested, including test number, system or equipment tag number and location, and notation about apparent acceptability of results.
 - c. Activities scheduled but not conducted per schedule.
 - d. Cx compliance issue report log.
 - e. Schedule changes for remaining Cx process work, if any.
5. Data trend logs shall be initiated and running prior to time scheduled for test demonstration.

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- a. Trend log data format shall be multiple data series graphs. Where multiple data series are trend logged concurrently, present data on a common horizontal time axis. Individual data series may be presented on a segmented vertical axis to avoid interference of one data series with another, and to accommodate different axis scale values. Graphs shall be sufficiently clear to interpret data within accuracy required by acceptance criteria.
 - b. Attach to data form printed trend log data collected during test or test demonstration.
 - c. Record, print out, and attach to data form operator activity during time trend log is running. During time trend log is running, operator intervention not directed by test procedure invalidates test results.
- 6. System Alarm Logs: Record and print out a log of alarms that occurred since last log was printed. Evaluate alarms to determine if previous day's work resulted in any conditions that are not considered "normal operation."
 - a. Conditions that are not considered "normal operation" shall be reported on a Cx issue report attached to alarm log. Resolve as necessary. The intent of this requirement is to discover control system points or sequences left in manual or disabled conditions, equipment left disconnected, set points left with abnormal values, or similar conditions that may have resulted from failure to fully restore systems to normal, automatic control after test completion.

3.9 CERTIFICATE OF CONSTRUCTION-PHASE COMMISSIONING (Cx) PROCESS COMPLETION

- A. When Contractor considers that construction-phase Cx process, or a portion thereof which District agrees to accept separately, is complete, Contractor shall prepare and submit to District and CxA through Construction Manager a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter Contractor's responsibility to compete Cx process.
- B. On receipt of Contractor's list, CxA will make an inspection to determine whether construction-phase Cx process or designated portion thereof is complete. If CxA's inspection discloses items, whether included on Contractor's list or not, which are not sufficiently complete as defined in "Construction-Phase Cx Process Completion" Paragraph in "Definitions" Article, Contractor shall, before issuance of Certificate of Construction-Phase Cx Process Completion, complete or correct such items on notification by CxA. In such case, Contractor shall then submit a request for another inspection by CxA to determine construction-phase Cx process completion.
- C. Promptly correct deficient conditions and issues discovered during Cx process. Costs of correcting such deficient conditions and issues, including additional testing and inspections, cost of uncovering and replacement, and compensation for Construction Manager's, Architect's, and CxA's services and expenses made necessary thereby, shall be at Contractor's expense.

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- D. When construction-phase Cx process or designated portion is complete, CxA will prepare a Certificate of Construction-Phase Cx Process Completion that shall establish date of completion of construction-phase Cx process. Certificate of Construction-Phase Cx Process Completion shall be submitted prior to requesting inspection for determining date of Substantial Completion.

END OF SECTION 01 91 13

SECTION 02 41 16
STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Demolition and removal of buildings **[and site improvements]**.
2. **[Abandoning in-place] [Removing]** below-grade construction.
3. Disconnecting, capping or sealing, and **[abandoning in-place] [removing]** site utilities.
4. Salvaging items for reuse by District.

- B. Related Requirements:

1. Section 01 10 00 "Summary" for use of the premises, phasing requirements, interim housing considerations, coordination with occupants, etc.
2. Section **[01 32 01] [01 32 02] [01 32 03] [01 32 04]** "Construction Progress Documentation".
3. Section 01 32 33 "Photographic Documentation" for preconstruction photographs taken before building demolition.
4. Section 01 74 19 "Construction Waste Management and Disposal".
5. Section 02 41 19 "Selective Demolition" for partial demolition of buildings, structures, and site improvements.
6. Section 02 82 33 "Removal and Disposal of Asbestos Containing Materials".
7. Section 02 83 33 "Removal and Disposal of Material Containing Lead".
8. Section 02 84 33 "Removal and Disposal of Universal Waste and PCB".
9. Section 31 10 00 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.
10. Section 31 20 00 "Earth Moving".

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.

- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and **[deliver to the District ready for reuse] [store]**. Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects, including cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to the District that may be uncovered during demolition remain the property of the District.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to the District.

1.5 PRE-INSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be demolished.
 - 2. Review structural load limitations of existing structures.
 - 3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review and finalize protection requirements.
 - 5. Review procedures for noise control and dust control.
 - 6. Review procedures for protection of adjacent buildings.
 - 7. Review items to be salvaged and returned to the District.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Engineering Survey: Submit engineering survey of condition of building.
- C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
 - 1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain **[including means of egress from those buildings]**.
- D. Schedule of Building Demolition Activities: Indicate the following:
 - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.

2. Temporary interruption of utility services.
 3. Shutoff and capping **[or re-routing]** of utility services.
- E. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by demolition operations. Comply with Section 01 32 33 "Photographic Documentation." Submit before the Work begins.
- F. 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.
- 1.7 CLOSEOUT SUBMITTALS
- A. **[Inventory: Submit a list of items that have been removed and salvaged.]**
- B. **[Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.]**
- 1.8 QUALITY ASSURANCE
- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- 1.9 FIELD CONDITIONS
- A. Building(s) to be demolished will be vacated and their use discontinued before start of the Work.
- B. Building(s) immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Conditions existing at time of inspection for bidding purpose will be maintained by the District as far as practical.
1. Before building demolition, The District will remove the following items:

a. **<Insert items to be removed by the District>.**

- D. [Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify the District Construction Manager. Remove hazardous materials in accordance with Specification Sections 02 82 33, 02 83 33 and 02 84 33. The costs associated with such work shall be paid out of the appropriate Allowance, as approved by the District Construction Manager.]
- E. [Hazardous Materials: Present in buildings and structures to be demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
 3. Hazardous materials and locations are shown in the Drawings. The mitigation of this material is included in the Base Bid.
 4. If hazardous materials are encountered that are not shown in the Drawings, do not disturb; immediately notify the District Construction Manager. Remove hazardous materials in accordance with Specification Sections 02 82 33, 02 83 33 and 02 84 33. The costs associated with such work shall be paid out of the appropriate Allowance, as approved by the District Construction Manager.]
- F. On-site storage or sale of removed items or materials is not permitted.

1.10 COORDINATION

- A. Arrange demolition schedule so as not to interfere with The District's on-site operations **[or] [operations of adjacent occupied buildings]**.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI / ASSE A10.6 and NFPA 241.

2.2 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Section 31 20 00 "Earth Moving."

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.
- C. 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. Comply with Section 01 32 33 "Photographic Documentation."

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.
- B. Salvaged Items: Comply with the following:
 - 1. Clean salvaged items of dirt and demolition debris.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to the District.
 - 4. Transport items to storage area designated by the District.
 - 5. Protect items from damage during transport and storage.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.
 - 1. Arrange to shut off utilities with utility companies.
 - 2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
 - 3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.

4. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of demolition.
- C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.
 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by the District and authorities having jurisdiction.
 2. Provide temporary services during interruptions to existing utilities, as acceptable to the District and authorities having jurisdiction.
 - a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.
- D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 01 50 00 "Temporary Facilities and Controls."
 1. Protect adjacent buildings and facilities from damage due to demolition activities.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
 7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.5 DEMOLITION, GENERAL

- A. General: Demolish indicated buildings **[and site improvements]** completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Do not use cutting torches until work area is cleared of flammable materials..
 2. Maintain active fire watch and portable fire-suppression devices during flame-cutting operations.
 3. Maintain active fire watch after flame-cutting operations per Contractor's approved Emergency Safety and Health (ES&H) Execution Plan.
 4. Maintain adequate ventilation when using cutting torches.
 5. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from the District and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Explosives: Use of explosives is not permitted.

3.6 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- C. Salvage: Items to be removed and salvaged are indicated below:
1. **<Insert items to be salvaged>.**
- D. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, completely.
- E. Existing Utilities: Abandon existing utilities and below-grade utility structures. Cut utilities flush with grade.
- F. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within 5 feet outside footprint indicated for new construction. Abandon utilities outside this area.
 1. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements in Section 31 20 00 "Earth Moving."
- G. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.
- H. Hydraulic Elevator Systems: Demolish and remove elevator system, including cylinder, plunger, well assembly, steel well casing and liner, oil supply lines, and tanks.

3.7 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Section 31 20 00 "Earth Moving."
- C. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.8 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.9 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.
- B. Do not burn demolished materials.

3.10 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
 - 1. Clean roadways of debris caused by debris transport.

END OF SECTION 02 41 16

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary 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 or structure.
2. **[Demolition and removal of selected site elements.]**
3. **[Salvage of existing items to be reused or recycled.]**

- B. Related Requirements:

1. Section 01 10 00 "Summary" for use of the premises, phasing requirements, interim housing considerations, coordination with occupants, etc.
2. Section **[01 32 01] [01 32 02] [01 32 03] [01 32 04]** "Construction Progress Documentation".
3. Section 01 32 33 "Photographic Documentation" for preconstruction photographs taken before building demolition.
4. Section 01 50 00 "Temporary Facilities and Controls" for temporary construction and environmental protection measures for selective demolition operations.
5. Section 01 56 39 "Temporary Tree and Plant Protection"
6. Section 01 74 19 "Construction Waste Management and Disposal".
7. Section 01 73 00 "Execution" for cutting and patching procedures.
8. Section 02 41 16 "Structure Demolition".
9. Section 02 82 33 "Removal and Disposal of Asbestos Containing Materials".
10. Section 02 83 33 "Removal and Disposal of Material Containing Lead".
11. Section 02 84 33 "Removal and Disposal of Universal Waste and PCB".
12. Section 31 10 00 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.
13. Section 32 84 00 "Planting Irrigation"

1.3 ALLOWANCES

- A. Allowances for repair of existing termite-damaged materials **[not included in unit prices]** are specified in Section 01 21 00 "Allowances."

1.4 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and **[deliver to the District ready for reuse] [store]**.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.5 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects, including cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to the District that may be uncovered during demolition remain the property of the District.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to the District.

1.6 PRE-INSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Engineering Survey: Submit engineering survey of condition of building.

- C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.
- D. 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 District 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 District continuing occupancy of portions of existing building and of District partial occupancy of completed Work.
 - 6. Locations of proposed dust and noise control temporary partitions and means of egress.
 - 7. Means of protection for items to remain and items in path of waste removal from building.
- E. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces that might be misconstrued as damage caused by demolition operations. Comply with Section 01 32 33 "Photographic Documentation." Submit before Work begins.
- F. 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.
- G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.8 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.
- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.9 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.10 FIELD CONDITIONS

- A. The District will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so the District operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by the District as far as practical.
- C. Notify the District Construction Manager of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify the District Construction Manager. Remove hazardous materials in accordance with Specification Sections 02 82 33, 02 83 33 and 02 84 33. The costs associated with such work shall be paid out of the appropriate Allowance, as approved by the District Construction Manager.
- E. 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. Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
 - 3. Hazardous materials and locations are shown in the Drawings. The mitigation of this material is included in the Base Bid.
 - 4. If hazardous materials are encountered that are not shown in the Drawings, do not disturb; immediately notify the District Construction Manager. Remove hazardous materials in accordance with Specification Sections 02 82 33, 02 83 33 and 02 84 33. The costs associated with such work shall be paid out of the appropriate Allowance, as approved by the District Construction Manager.
- F. Termite Infestation: It is not expected that active termite infestations will be encountered in the Work.
 - 1. If active termite infestations are encountered, do not disturb; immediately notify the District Construction Manager who will have the infestations investigated. Allow three days when no work will be permitted on those portions of the Work suspected of having active termite infestations.
- G. Storage or sale of removed items or materials on-site is not permitted.

- H. 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.

1.11 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

- 1. **<Insert warranted system>.**

- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.12 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with the District 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 ANSI / 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 the District. The District does not guarantee that existing conditions are same as those indicated in Project Record Documents.

- C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- D. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs or video.
 - 1. Comply with requirements specified in Section 01 32 33 "Photographic Documentation."
 - 2. 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.
- E. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to District Construction Manager.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 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. Arrange to shut off utilities with utility companies.
 - 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 fire-suppression systems, plumbing, and HVAC 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. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to the District.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.
 - h. Fire-Suppression Systems: Provide temporary fire protection per Contractor's approved Emergency Safety and Health (ES&H) Execution Plan.
4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
- a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.4 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. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
- 1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.5 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.
 5. Maintain active fire watch and portable fire-suppression devices during flame-cutting operations.
 6. Maintain active fire watch after flame-cutting operations per Contractor's approved Emergency Safety and Health (ES&H) Execution Plan.
 7. Maintain adequate ventilation when using cutting torches.
 8. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 9. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 10. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 11. 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 Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to the District.
 4. Transport items to the District storage area **[on-site] [off-site] [designated by District]**.
 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.

3. Protect items from damage during transport and storage.
 4. 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.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by District Construction Manager, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. **[Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.]**
- B. **[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.]**
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- E. 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.
1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI (Resilient Floor Covering Institute).
- F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section **<Insert Section number and title>** for new roofing requirements.
1. Remove existing roof membrane, flashings, copings, and roof accessories.
 2. Remove existing roofing system down to substrate.
- G. Air-Conditioning Equipment: Remove equipment without releasing refrigerants. Cap all ducts to remain, if new equipment is not immediately installed.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 - 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. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

3.8 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.

3.9 SELECTIVE DEMOLITION SCHEDULE

- A. Remove: **<Insert description of items and construction to remove>.**
- B. Remove and Salvage: **<Insert description of items to remove and salvage>.**
- C. Remove and Reinstall: **<Insert description of items to remove and reinstall>.**
- D. Existing to Remain: **<Insert description of items to remain>.**
- E. Dismantle: **<Insert description of items to be removed>.**

END OF SECTION 02 41 19

SECTION 02 82 33**REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Hazardous Building Materials Survey Reports, prepared by the District's Consultant, are available from the District Construction Manager.

1.2 REFERENCE DOCUMENTS

- A. The current issue of the following documents are incorporated herein and shall govern the conduct of the Work. Where conflict among requirements or with this specification exists, the more stringent requirements shall apply.
- B. Code of Federal Regulations (CFR):
 - 1. 29 CFR 1910, Occupational Safety and Health Standards, General.
 - 2. 29 CFR 1910.134 Respiratory Protection.
 - 3. 29 CFR 1910.1001 Asbestos – General Industry.
 - 4. 29 CFR 1910.1200, Hazard Communication.
 - 5. 29 CFR 1926 Occupational Safety and Health Standards, Construction.
 - 6. 29 CFR 1926.55, Gases, Vapors, Fumes, Dusts, and Mists.
 - 7. 29 CFR 1926.59, Hazard Communication.
 - 8. 29 CFR 1926.1101 Asbestos – Construction Industry.
 - 9. 40 CFR 61 Subpart A and Subpart M, USEPA, National Emission Standards for Hazardous Air Pollutants (NESHAP).
 - 10. 40 CFR, Part 763, The Asbestos Hazard Emergency Response Act.
 - 11. 49 CFR Parts 106, 107, 171 to 179, The Transportation Safety Act, Hazardous Material Transportation Act.
- C. California Code of Regulations (CCR):
 - 1. Title 8, Section 1514, Personal Protective Equipment
 - 2. Title 8, Section 1529 Asbestos in the Construction Industry.
 - 3. Title 8, Section 1531 Construction Respiratory Protective Equipment.
 - 4. Title 8, Section 3203 Injury and Illness Prevention Program.
 - 5. Title 8, Section 5144 Respiratory Protective Equipment.
 - 6. Title 8, Section 5155 Airborne Contaminants.
 - 7. Title 8, Section 5194 Hazard Communication.
 - 8. Title 8, Section 5208 General Industry Safety Orders, Asbestos Regulations.

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- D. State and Local Regulations: Those regulations promulgated under the Clean Air Act or Occupational Safety and Health Act and incorporated in a State plan recognized by EPA or OSHA, respectively.
 - 1. San Diego Air Pollution Control District Subpart M, National Emission Standards for Asbestos, Rule 361.145 Standard for Demolition or Renovation.
 - 2. San Diego Air Pollution Control District – Regulation XII, Rule 1206: Asbestos Removal, Renovation, and Demolition (Adopted and Effective 11/15/17).
- E. American National Standards Institute (ANSI):
 - 1. ANSI Standard Z9.2 Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems.
- F. American Society for Testing and Materials (ASTM):
 - 1. ASTM Standard D1331 Standard Test Methods for Surface and Interfacial Tension of Solutions of Surface Active Agents.
 - 2. ASTM Standard E1368 Standard Practice for Visual Inspection of Asbestos Abatement Projects.
 - 3. ASTM Standard E1494 Standard Practice for Encapsulation Testing of Friable Asbestos-Containing Surfacing Materials.

1.3 SUMMARY

- A. Section includes the furnishing of all labor, materials, facilities, equipment, services, employee training, permits, agreements, waste transport and disposal necessary to perform the work required for asbestos removal in accordance with these specifications, EPA, APCD, OSHA, NIOSH, State of California regulations, and any other applicable federal, state and local government regulations. Whenever there is a conflict or overlap of the above references, the most stringent provisions are applicable.
- B. Perform the work and provide service as needed to accomplish abatement of asbestos containing materials at the Project Site. Specific locations and materials to be removed/disturbed are indicated on the Drawings. Sampling data for identification of asbestos containing materials and non-asbestos containing materials is available from the District Construction Manager. The requirements of all regulations and specifications must be observed for the removal or disturbance of any material containing any amount of "asbestos." Confirm ACM and ACCM locations and quantities prior to initiating renovation activities
- C. Comply with the requirements of all regulations and specifications for the removal or disturbance of any material containing any amount of "asbestos," including materials containing <1% asbestos.

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- D. Comply with all requirements of this specification. Alternate and innovative technologies and procedures are encouraged and must be submitted in detail for approval prior to any work being performed. Any alternative technologies submitted must have been written by a Certified Industrial Hygienist (CIH) or State of California Certified Asbestos Consultant (CAC).
- E. In the event ACMs or ACCMs in addition to those indicated in the Drawings are discovered, do not disturb. Immediately notify the District Construction Manager who will have the additional materials tested.
- F. Related Requirements:
 - 1. Section 02 83 33 "Removal and Disposal of Materials Containing Lead" for lead abatement.
 - 2. Section 02 84 33 "Removal and Disposal of Universal Waste and PCB" for Universal Waste and PCB abatement.

1.4 ALLOWANCES

- A. Allowances for removal and disposal of ACM and ACCM in addition to those indicated on the Drawings are specified in Section 01 21 00 "Allowances."

1.5 DEFINITIONS

- A. All terms not defined herein shall have the meaning given in the applicable publications and regulations.
- B. "Abatement Activities" shall mean all activities from the initiation of work area preparation through successful clearance air monitoring performed at the conclusion of an asbestos project.
- C. "Air Lock" shall mean an enclosed space designed to control air movement between two areas. It is composed of sealed spaces with curtained doorways at its portals. A Worker Decontamination Facility contains at least three air locks.
- D. "Ambient Air Monitoring" shall mean measurement or determination of airborne asbestos fiber concentrations outside but in the general vicinity of the work site.
- E. "Amended Water" or "Wetting Agent" shall mean water to which an approved surfactant has been added in proportion of at least one (1) ounce surfactant to five (5) gallons water.
- F. "Asbestos-Containing Materials (ACM)" shall mean any insulation, fireproofing, plaster, ceiling or floor tiles and any other building materials containing more than 1% asbestos (>1%).

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- G. "Asbestos-Containing Construction Material (ACCM)", also referred to as "trace" asbestos materials, shall mean any material containing between one-tenth of one percent and one percent asbestos (0.1% - 1%).
- H. "Asbestos-Contaminated Objects" shall mean any objects, which may be contaminated by asbestos or asbestos-containing material as determined by the Consultant.
- I. "Asbestos Disposal" shall mean the removal of containerized asbestos, asbestos-containing material, asbestos-containing waste material and asbestos-contaminated objects from the regulated area to the final EPA approved disposal site.
- J. "Authorized Visitors" shall mean any visitor authorized by the Consultant or any representative of a regulatory agency or other agency having jurisdiction over the project.
- K. "Barriers or Containment Barriers" shall mean walls, tunnels, or enclosures erected to separate any section of an abatement area from adjoining spaces. Where indicated on drawings, barriers shall be constructed of 2'x 4's, with minimum 1/2" plywood walls, and all seams in plywood and edges shall be sealed airtight with caulking. The inside (work) side of all such barriers shall be covered with two (2) layers of 6-mil polyethylene sheeting. Tunnels to maintain public access through a work area shall also be defined as part of the barriers. All lumber, plywood, and polyethylene shall be flame retardant and shall bear manufacturer's label.
- L. "Baseline or Background Air Monitoring" shall mean a measurement or determination of airborne asbestos fiber concentrations inside the workplace and outside a building prior to starting abatement activities.
- M. "Certified Clean" shall mean that a work area has no visible signs of fibrous materials or other contamination and does not have levels of airborne fiber above the defined air clearance criteria.
- N. "Class I asbestos work" means activities involving the removal of thermal systems insulation (TSI) and surfacing ACM and PACM.
- O. "Class II asbestos work" means activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.
- P. "Class III asbestos work" means repair and maintenance operations, where "ACM", including TSI and surfacing ACM and PACM, is likely to be disturbed.
- Q. "Class IV asbestos work" means maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste and debris resulting from Class I, II, and III activities.

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- R. "Clean or Decontaminate" shall mean to make a surface free of all visible and optically detectable fibers by thoroughly HEPA-vacuuming and wet washing with sponges and mops.
- S. "Clean room" shall mean an uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.
- T. "Competent Person" shall mean one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them, In addition, for Class I and Class II work, one who is specially trained in a training course that meets the criteria of EPA's Model Accreditation Plan (40 CFR part 763) for supervisor, or its equivalent.
- U. "Consultant" shall mean the consulting industrial hygienist. The Consultant is an independent party retained by the District to provide consultation services for asbestos abatement activities.
- V. "Curtained Doorway or Entrance" shall mean a portal which limits air movement between two areas, constructed by placing two overlapping sheets of plastic over an existing or temporary doorway, by securing each along the top of the doorway, by securing the vertical edge of one sheet along one vertical side of the doorway, and by securing the vertical edge of the other sheet along the opposite vertical side of the doorway.
- W. "Decontamination Facility (DF) or Area (DA)" shall mean a series of connected rooms or spaces including clean room, shower room, and contaminated dirty (equipment) room, each separated by an air lock; and used for the decontamination of all workers, and their personal protective equipment leaving an asbestos removal work area, as well as for access to such work areas. All decontamination facilities shall be a "structural" (i.e. capable of supporting workers standing above).
- X. "Disposal Site" shall be an EPA approved landfill.
- Y. "District" shall mean the San Diego Unified School District.
- Z. "Disturb" shall mean contact that releases fibers from ACM, PACM, or ACCM. It includes any activity that disrupts the matrix of ACM, ACCM, or PACM, crumbles or pulverizes ACM, ACCM, or PACM, or generate visible debris from ACM, ACCM or PACM. Any activity which alters, changes, or stirs ACM or PACM, including encapsulation, enclosure or repair of ACM or asbestos contaminated material.
- AA. "Encapsulation" shall mean procedures necessary to coat or saturate material with an approved encapsulant liquid to control the possible release of fibers into the ambient air. "Encapsulant" (sealant) shall mean liquid material which can be applied to other solid material which reduces the possible release of fibers from the material either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant).

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- BB. "Equipment room" means a contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.
- CC. "Fiber" shall mean a particulate form of asbestos, 5 micrometers or longer, with a length-to-diameter ratio of at least 3 to 1.
- DD. "Final Cleaning" shall mean that no three-dimensional material is visible to the naked eye.
- EE. "Fixed Items" shall mean equipment, furniture, radiators, or other objects, which cannot be removed from the work area, plus walls and floors.
- FF. "HEPA-Filtered Exhaust Units or Fans" shall mean a fan equipped with a High Efficiency Particulate Air:(HEPA)filter greater than 99.97 percent efficient by 0.3 micron DOP test, and complying with ANSI Z9.2, Local Exhaust Ventilation. It shall be used to create a pressure in a work area (reduced with respect to surrounding areas) in order to prevent the escape of asbestos fibers. It shall also be used to reduce and control the airborne concentration of asbestos fibers.
- GG. "HEPA-Filtered Vacuum" shall be a vacuum cleaner specifically designed for and equipped with HEPA-filtration.
- HH. "Install" shall mean set in place completely ready for normal use or service, including all necessary mounting facilities, connections and testing.
- II. "Isolation Barriers" shall mean the construction of partitions, the placement of solid materials, and the plasticizing of apertures to seal off the workplace from surrounding areas and to contain asbestos fibers in the work area.
- JJ. "Lockout" shall mean the safe, approved means for shutting down HVAC equipment, electrical panels or breakers and water so that they cannot be inadvertently turned back on.
- KK. "Log" shall mean an official record of all activities that occurred during the project and it shall identify the District, Contractor, workers, floor number, date, work area, and other relevant information to the project.
- LL. "Major Abatement" shall mean the removal of ACM under contained conditions utilizing full isolation and negative pressure ventilation systems.
- MM. "Minor Abatement" shall mean the removal of ACM utilizing "glovebag" methods or modified containment.
- NN. "Outside Air" shall mean the air outside the buildings and structures.
- OO. "Outside/Ambient Air Samples" shall mean samples collected outside of the containment area in the building and analyzed using the NIOSH 7400 Method.

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- PP. Presumed Asbestos-Containing Material (PACM) means thermal systems insulation or surfacing material found in buildings constructed no later than 1980, unless rebutted according to 8 CCR 1529 (k)(4).
- QQ. "Project" or "Project Site" shall refer to **<insert school name>**.
- RR. "Protect Fixed Items" shall mean to cover with solid enclosures and 6-mil polyethylene sheeting, and secure by taping or gluing water and airtight.
- SS. "Provide" shall mean furnish (or supply) and install.
- TT. "Regulated Area" shall have the meaning set forth in 8 CCR 1529, which is an area established by the employer to demarcate areas where Class I, II, and III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work accumulate; and a work area within which airborne concentrations of asbestos, exceed or there is a reasonable possibility they may exceed the permissible exposure limit.
- UU. "Remove Asbestos" shall mean to make a surface free of all visible fibrous materials or microscopically detectable asbestos fibers.
- VV. "Renovation" shall mean an addition or alteration or a change or modification of building or the service equipment therefore which is not classified and an ordinary repair.
- WW. "Repair" shall mean corrective action using specified work practices (e.g. glove bag, plastic tent procedures, etc) to minimize the likelihood of fiber release from minimally damaged area of ACM.
- XX. "Replacement Material" shall mean any material approved by the District used to replace ACM.
- YY. "Seal" or "Block and Seal" shall mean preparing a space or area such that there is no air movement or passage to and from the area. "Isolation barrier" shall mean the system of seals or other items, which prevent air movement to and from any work area.
- ZZ. "Shift" shall mean a worker's or simultaneous group of workers' complete daily term of work.
- AAA. "Surface Barriers Protective Coverings or Poly" shall mean the plasticizing of walls, floors, and fixed objects within the work area to prevent contamination during subsequent abatement activities.
- BBB. "Surfactant" shall mean a chemical wetting agent added to water to improve penetration into asbestos-containing materials and thereby reduce the generation of airborne asbestos fibers.
- CCC. "Work Area" shall mean an area where asbestos removal or other abatement procedures are being performed. A work area is considered a contaminated space

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between the times preparation begins and the time the area is certified clean by the Consultant.

DDD. "Work Place" shall mean the work area and the project site.

1.6 PRE-ABATEMENT MEETINGS

A. Pre-Abatement Conference: Conduct conference at Project Site.

1. The District will arrange a Pre-Abatement Conference, attended by a representative of the District, the Consultant, the General Contractor, and the Abatement Contractor.
2. The Contractor shall identify his Supervisor and Foreman at this conference.
3. Provide electronic copies of "Action Submittals" at least five working days prior to this conference.
4. Pre-Abatement Conference topics include:
 - a. Contractor listing of existing site condition (e.g. damage).
 - b. Contractor and supporting vendor site access and parking.
 - c. Coordination of Contractor access routes to the work area, including approved doors, stairways, corridors, and elevators.
 - d. Availability of building utility services, such as power, water, and drains.
 - e. Determination of equipment and other movable items to be removed from the work area(s) by the Contractor, and the location of temporary storage space.
 - f. Location, coverage, and use of isolation barriers and decontamination facilities.
 - g. Emergency Response Procedures.
 - h. Visual identification and quantification of ACM and ACCM.

1.7 ACTION SUBMITTALS

A. Asbestos Abatement Plan prepared and signed by a Competent Person. The Plan shall be site specific, and shall include minimally the following:

1. The proposed removal methods for each type of ACM or ACCM including a detailed listing of all materials, tools, equipment, and expendable supplies that will be used during the project. For each listed item provide (as appropriate) the manufacturer's name, catalog number or model, a description of its function and location of use, an actual sample or photocopy of manufacturer's brochure. The listing shall include at a minimum spray encapsulants, wetting agents, spray adhesives (including Material Safety Data Sheets (MSDS), and equipment including HEPA-vacuums, HEPA-filtered exhaust fans, respirators, protective clothing, waste containers, protective fireproof plastic coverings, sealing tapes, materials and compounds, temporary power and electric equipment, shower water pumps and filters, encapsulating equipment, and materials for constructing decontamination facilities and barriers.

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2. A sketch or written description detailing the regulated work area, decontamination set-up, waste-load out, location and number of negative machines.
3. A description of the exhaust system including proposed number, capacity, and location of HEPA exhaust units, and the method of discharge to the building exterior.
4. A work sequencing plan that includes the number of shifts, shift times, and number of workers per shift for each phase of remediation work. Include name, summary of experience, and certifications for asbestos work of all personnel, including supervisors who may be used during the contract period (minimum of one qualified supervisor is required).
5. A waste disposal plan including the labeling of waste containers, proposed waste hauler, and proposed landfill(s) for friable and non-friable asbestos waste.
6. A security plan including the locations of warning signs, prevention of unauthorized entry into the area, log book forms for recording entries into the work areas, accident prevention, equipment, and methods to communicate between personnel inside and outside the work areas.
7. An emergency/contingency plan including emergency ingress/egress from the work areas, accident notification policy, emergency fire and accident response procedures (including emergency decontamination procedures).

1.8 INFORMATIONAL SUBMITTALS

A. Pre-Abatement Submittals:

1. Copies of notifications to government entities, including San Diego Air Pollution Control District and California-OSHA (Division of Occupational Safety and Health). Notifications by Contractor are limited to only those parties Contractor is required to notify by law and this specification. Notification to the Project Inspector and Consultant are also required at least 5 days prior to commencement of each phase or mobilization of asbestos work.
2. Signed documentation of training and education of all proposed workers, including respirator fit tests and copies of OSHA specified medical exams with respirator approvals. If documents expire prior to final project completion, provide updated documents.
3. List of all Sub-Contractors proposed for this project, with their specialty and qualifications along with submittals meeting the same requirements.
4. Proposed waste hauler and copies of applicable licenses, including solid waste transportation registration issued by the California Department of Health Services Toxic Substance Division.
5. Proposed landfill for disposal of waste materials and letter from landfill authorizing hauler to dispose there.
6. A copy of the Contractor's State of California, Department of Industrial Relations, Division of Occupational Safety and Health, Certificate of Registration for Asbestos-Related Work.

B. Submittals During Abatement Work:

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1. Regulated area entry logs showing names of person entering the workspace, date and time of entry and exit.
2. Safety log, including record of any accident, emergency evacuation, and any other safety and health incident.
3. Submit on a daily basis to the Consultant:
 - a. Personal air monitoring results as conducted by the Contractor.
 - b. For OSHA Class I asbestos work, recording/printouts of negative pressure manometer readings inside containment.

C. Submittals After Abatement Work:

1. Original manifests and receipts acknowledging disposal of all hazardous and non-hazardous waste material from the project showing delivery date, quantity, and appropriate signature of landfill's authorized representative.
 - a. Submit within 30 days of date that material was transported off site.

1.9 CLOSEOUT SUBMITTALS

A. Submit immediately upon completion of abatement work:

1. Original manifests and receipts acknowledging disposal of all hazardous and non-hazardous waste material from the project showing delivery date, quantity, and appropriate signature of landfill's authorized representative.
 - a. Submit within 30 days of date that material was transported off site.
2. A copy of the entry-exit logbook.
3. All personal monitoring results.

1.10 PERFORMANCE REQUIREMENTS

A. Authority to Stop Work:

1. The District retains the authority to stop abatement work at any time the District and Consultant determines that conditions are not within the specifications and applicable regulations. The stoppage of work shall continue until conditions have been corrected and corrective steps have been taken to the satisfaction of the Consultant and/or District.
2. Stop Work Orders may be issued for, but are not limited to, the following:
 - a. Poor work practices related to fiber control, including failure to adequately wet and failure to keep regulated area clean and free from debris.
 - b. Excessive airborne fibers inside or outside the work area.
 - c. Breaks in barriers.
 - d. Loss of negative air pressure (i.e. a manometer reading of less than 0.02 inches of water) for any OSHA Class I Work.

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- e. Any other situation (outside the work area) where the District and/or Consultant establishes that the airborne clearance criterion is reached (i.e. fiber concentration at or greater than 0.01 fibers/cc outside containment). When the clearance criterion of 0.01 fibers/cc is reached for non-work areas, stop work and initiate cleanup procedures to reduce airborne fiber levels to below 0.01 f/cc for non-work areas.

B. Project Supervision:

1. Provide English-speaking on-site Supervisor and at least one Foreman for each work area at all times while abatement work is in progress. The Supervisor and Foreman shall be Competent Persons, as defined by 8 CCR 1529, and must be experienced in asbestos abatement work, knowledgeable of all EPA, OSHA, and local regulations, and capable of skillfully executing all work promptly, efficiently, and in compliance with all requirements of this Specification.
2. Upon request of the District and/or Consultant, submit proof of qualifications and project experience for the Supervisor and Foreman.
3. The District reserves the right to have any supervisory personnel removed if they do not demonstrate the requisite experience or skills to safely direct the work, and adequately protect their own employees or District.
4. Instruct, train, and provide required protective devices for all workers of other trades who must enter any work area before it is certified clean. The instruction shall include, at a minimum, proper use and fitting of respiratory protective devices and protective clothing, entry and exit procedures for all work areas, hazards, or asbestos exposure, work procedures, and other safety requirements contained in this Specification.
 - a. Proof of such instructions for other trades shall be supplied prior to being allowed to enter the work area.
 - b. The instruction does not relieve the other trades from the regulatory requirements for medical surveillance and other requirements of 8 CCR 5144 for the use of respiratory protective devices. Copies of the medical surveillance examinations shall also be provided prior to being allowed to enter the work area.

C. Availability of Trained Personnel:

1. Since other construction-related activities cannot commence until the successful decontamination of the work area, it is imperative that a sufficient number of trained personnel be provided for the duration of abatement activities to complete the work within the required schedule.
2. Do not staff the project with untrained, unqualified, or any unapproved personnel to speed up the completion of the abatement work.

D. Protection of Persons and Property:

1. General Safety Requirements:

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- a. Initiate, maintain, and supervise all safety precautions and programs in connection with the Work. Take all reasonable precautions for the safety of, and provide reasonable protection to prevent damage, injury, or loss to:
 - 1) All employees on the Work and other persons who may be affected thereby.
 - 2) All Work and all materials and equipment to be incorporated therein.
 - 3) Other property at the Project Site and adjacent thereto.
 - b. Give all notices and comply with all applicable laws, ordinances, rules, regulations, and orders of any public authority bearing on the safety of persons and property and their protection from damage, injury, and loss.
 - c. Remedy all damage or loss of any property caused in whole or in part by the Contractor, any Sub-Contractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The Contractor shall be responsible for the protection of any finished work from damage or defacement by his/her operation.
2. Assess and control the real or potential impacts of the Work upon the District's Life Safety Systems (e.g. smoke detectors, sprinkler systems, etc.). Establish coordination prior to any commencement of work, subject to modification by the District at any time, based on the District's assessment of risks to the function of the life safety systems associated with the Contractor's actions.
 3. Establish an effective safety program in accordance with the requirements set forth in 8 CCR Subchapter 4, Construction Safety Orders and 29 CFR 1926 Safety and Health Regulations for Construction, Subpart A through Z.
- E. Respiratory Protection:
1. Provide all workers, foremen, superintendents, authorized visitors, and inspectors who have been medically cleared for respirator use and fit tested for the respirator type being used, personally issued and marked respiratory protective equipment approved by NIOSH. When respirators with disposable filters are employed provide sufficient filters for replacement as necessary by the worker or authorized visitor. Filters shall be disposed of as contaminated waste.
 2. Instruct and train each worker involved in asbestos abatement (Class I, II, III) or maintenance and repair of asbestos-containing materials in proper respiratory use and require that each worker always wear a respirator properly fitted on the face in the work area from the start of any operation that may cause airborne asbestos fibers until the work area is completely decontaminated and cleared for re-occupancy. Use respiratory protection appropriate for the fiber level encountered in the work place or as required for other toxic or oxygen-deficient situations encountered.
 3. A respirator providing a minimum protection factor of 10 and equipped with a HEPA/P100 filter shall be used as long as 0.5 f/cc is not exceeded within the work area. If exceeded, all work inside the work area shall stop, and corrective actions (cleaning and better use of engineering controls) will be required until

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- fiber levels are reduced to less than 0.5 f/cc. Filtering facepiece device respirators are not permitted.
4. Unless otherwise permitted, respiratory protection as specified herein shall be worn at all times, within the regulated work area.
 5. Facial hair such as beards, long sideburns, and moustaches that interfere with the seal of air purifying type respirators are prohibited. Workers with eye corrective lenses (contact lenses or glasses) shall wear the corrective lenses in a manner that is in compliance with 8 CCR 1529 and 8 CCR 5144.
 6. Respiratory protection use, inspection, maintenance, decontamination, and storage procedures shall meet the requirements of 8 CCR 5144. In addition:
 - a. Respiratory protection shall be the last piece of worker protection equipment to be removed. Workers must wear respirators in the shower when going through decontamination procedures as stated herein.
 - b. Airline respirators with HEPA-filtered disconnect shall be disconnected in the equipment room and worn into the shower. Powered air-purifying respirator face pieces shall be worn into the shower. Filter/power pack assemblies shall be decontaminated in accordance with manufacturers' recommendations.
 - c. Whenever respirator design permits, workers shall perform a positive and negative air pressure fit test each time a respirator is worn. Powered air-purifying respirators shall be tested for adequate flow (using the methods specified by the manufacturer) every four (4) hours of use and each time the worker enters or exits the work area. Maintain written logs of these tests.
 - d. Furnish to the Consultant written documentation that each worker is medically approved to wear respirators and has been properly trained in their use, inspection, care, maintenance, and fit testing pursuant to the Contractor's written Respirator Plan.
 7. Except to the extent that more stringent requirements are written directly into the Contract Documents, the following regulations and standards have the same force and effect (and are made a part of the Contract Documents by reference) as if copied directly into the Contract Documents, or as if published copies were bound herewith. Where there is a conflict in requirements set forth in these regulations and standards, the more stringent requirements must be met.
 - a. OSHA U.S. Department of Labor Occupational Safety and Health Administration, Safety and Health Standards 29 CFR 1910, Section 1001 and Section 1910.134, 29 CFR 1926.
 - b. NIOSH National Institute for Occupational Safety and Health.
 - c. California Code of Regulations 8 CCR 5144.

F. Personal Protective Equipment:

1. Provide to all workers, foremen, superintendents and authorized visitors and inspectors that may enter the asbestos regulated work area protective disposable clothing consisting of full-body coveralls, head covers, gloves, 18-inch high boot-type covers or reusable footwear, and eye protection.

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2. Provide hard hats and safety shoes as required by job conditions and safety regulations.
3. Reusable footwear, hardhats, and eye protection devices shall be left in the "Contaminated Equipment Room" until the end of the asbestos abatement work, at which time they shall be disposed of as ACM waste or transferred to another work area by methods approved by the Consultant.
4. All disposable protective clothing shall be discarded and disposed of as asbestos waste every time the wearer exits from the workspace to the outside through the decontamination facilities.

G. Decontamination Facilities:

1. Worker decontamination enclosure systems shall be provided at all locations where workers will enter or exit the work area. At a minimum, one system at a single location is required.
2. Worker decontamination enclosure systems constructed at the project site shall utilize 6-mil black or opaque polyethylene sheeting or other approved materials for privacy.
3. The personal decontamination unit shall not be located inside the work area without written authorization from the District and/or Consultant.
4. Alternate methods of providing Decontamination facilities may be submitted to the District and/or Consultant for approval. Implementation of these alternative methods may not proceed without written approval by the District and/or Consultant.
5. For OSHA Class I (Friable) work, the worker decontamination enclosure system shall consist of at least a clean room, a shower room, and an equipment room, each separated from the other and from the work area by airlocks.
6. For OSHA Class II (Non-friable) work or a work area for the removal of an ACCM, the worker decontamination enclosure system shall consist of at least a clean room and an equipment room, each separated from each other and the work area by airlocks.
7. The clean room shall be sized for the work crew. Space for storing respirators shall be provided in this area. Clean work clothes, clean disposable clothing, replacement filters for respirators, towels and other necessary items shall be provided in adequate supply in the clean room. A location for posting notices shall also be provided in this area.
8. The shower room shall contain one or more showers to adequately accommodate workers. Each showerhead shall be supplied with warm and cold water, and be protected against leakage of any kind. An adequate supply of soap, shampoo and towels shall be supplied by the Contractor and be available at all times. Shower water shall be drained, collected, and filtered through a system with at least a 0.5 to 1.0 micron particle size collection capacity.
9. The equipment room shall be used for the storage of equipment and tools at the end of a shift after the tools have been decontaminated using HEPA-filtered vacuum and/or wet cleaning techniques, as appropriate. Replacement filters, stored in sealed containers until used, for filtration equipment, extra tools, containers, surfactants and other materials and equipment that may be required during abatement activities may also be stored in the equipment room. A walk-off pan (e.g. a small children's swimming pool or equivalent), filled with water, shall

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be located in the room for workers to clean off foot coverings after leaving the work area and prevent excessive contamination of the worker decontamination enclosure system. A drum lined with a labeled 6-mil polyethylene bag for collection for disposable clothing shall be located in the equipment room. Contaminated footwear shall be stored in this area for reuse the following workday.

H. Worker Protection Procedures:

1. Provide all personnel throughout the abatement process with the specified protective clothing and respiratory protection. Ensure that all personnel entering and leaving the workspace follow the following procedures:
 - a. Entering from the outside: Change from street clothes into the protective clothing and wear clean protective gear, go through Shower Room into Dirty Equipment Room, pick up equipment and tools, and enter the Work Area.
 - b. Exiting from the Work Area: Dispose of all protective clothing into plastic bags labeled for asbestos waste. Do not take off the respirator, but still wearing the respirator, enter the shower, and shower thoroughly. Remove respirator and wash and wipe thoroughly to decontaminate the respirator. After drying, enter the Clean Room, store the decontaminated respirator in the assigned space, and dress into street clothes.
2. Post written procedures in workplace and train all personnel on the procedures for the evacuation of the injured and the handling of potential fires. Provide air to a seriously injured worker without delay for decontamination. Make provisions to minimize exposure of rescue workers and to minimize spreading of contamination during evacuations and fire procedures.
3. Instruct all employees and workers in the proper care of their personally issued respiratory equipment, including daily maintenance, sanitizing procedures, etc.
4. Contractor's project supervisory personnel shall inspect all respiratory equipment at the beginning of each work period, including breaks and lunch periods. Written records of these inspections shall be maintained and provided to the Consultant.

I. Exposure Controls and HEPA-Filtered Exhaust Ventilation:

1. Install inside the work area one or more portable HEPA-filtered exhaust units to maintain the area, including the Decontamination Facilities, under negative air pressure, and to reduce or control airborne asbestos fiber concentrations. Provide a contingency plan for maintaining negative air requirements in the event of mechanical failure.
2. To determine the number of required units, compute the total cubic footage of all workspaces within the work and determine the air moving capacity of all the HEPA-filtered units to be used in each workspace. This measurement shall be made in cubic ft/min. under a filter load equivalent to two inches of static pressure.

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- a. The exhaust(s) must be capable of providing: 1) at least four (4) full air changes per hour in the work area and for "Class I Work"; 2) an inward velocity through any openings, including the decontamination facilities, of at least 200 fpm; and 3) a static negative air pressure inside the area of a minimum of 0.02 inches water column. Each exhaust system shall have a dedicated power system and shall be operated continuously (24 hours/day) in accordance with "Specifications and Operating Procedures for the Use of Negative Pressure Systems for Asbestos Abatement," Guidance for Controlling Asbestos-Containing Materials in Building, EPA report Number 560/5-85-024 (1985).
- b. Each exhaust unit shall be equipped with the following:
 - 1) Magnehelic gauge to monitor the unit's air pressure difference across the filters and to interpret the magnehelic reading to CFM.
 - 2) Automatic shut off for filter failure or filters absence.
 - 3) Audible alarm with flashing red light for unit shutdown.
 - 4) Amber Flashing warning light for excessive filters loading.
 - 5) A safety system that prevents unit from being operated with the HEPA filter in backwards.
- c. All-exhaust air shall pass-through HEPA filters before being discharged to the exterior of a building. The exterior exhaust discharge point shall be at least 10 feet from a receptor such as an air intake port, or louvers.
- d. Before starting any work, submit in writing the proposed number, capacity, and location of exhausts, and the method of discharge to the building exterior. Work shall not be permitted until the Consultant approves the proposed exhaust system.
- e. Exhaust systems shall be operated twenty four (24) hours per day at all times during preparation, removal, encapsulation, and cleanup tasks as specified herein; and until final "clean air" certification is obtained for the area, and Consultant directs Contractor to shut the system down.
- f. On loss of negative air pressure or electric power, all work activities in the area shall stop immediately and shall not resume until power is restored and the HEPA-exhaust systems are operating again. When power failure or loss of negative pressure lasts, or is expected to last, longer than one hour, the following shall occur:
 - 1) The make-up air inlets in the decontamination facilities and any other make-up air inlets shall be sealed airtight;
 - 2) The decontamination facilities shall be sealed airtight after the evacuation of all personnel from the work area;
 - 3) All adjacent areas shall be monitored for asbestos fiber concentration upon discovery of, and subsequently throughout the power failure.
- g. Provide and continuously operate for all "Class I Work" an automatic air pressure differential recording instrument that produces a permanent record. Recorder shall have a range of -0.09" H2O to +0.09" H2O. Copies of the recorded reading shall be maintained and provided daily to the Consultant.

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- h. This system must conform to the previously described requirements and 29 CFR 1926.58 Appendix F "Exhaust Air Filtration System."
- J. Air Monitoring:
1. Consultant Air Monitoring:
 - a. Provide full cooperation and support to the Consultant throughout the course of the monitoring work. The Consultant will closely and continuously monitor the performance and execution of the work. The monitoring work will be performed inside the surrounding area to ensure full compliance with these specifications and all applicable regulations. Ambient air samples will be collected and analyzed by the Consultant. Consultant monitoring and inspections will include air samples at the entrance to the containment, air samples in the areas surrounding the work areas, at the negative-air handling unit exhaust, and outside the work area, checking of the Contractor's standard operating procedures, engineering controls, respiratory protection equipment, packing, packaging, transporting and disposal of asbestos, decontamination facilities and procedures, and any other aspects of the abatement process that may impact the health and safety of the people and the pollution of the environment.
 - b. The District will bear all costs in connection with the laboratory work required in Paragraph above. However, the costs of all subsequent laboratory analysis taken because the limits specified were exceeded on the initial tests shall be borne by the Contractor. The Contractor shall also conduct and bear the cost of personal air samples for OSHA compliance.
 - c. The Contractor may request copies of all laboratory reports presenting the results of the Consultant's air monitoring and inspection.
 2. Contractor Air Monitoring:
 - a. The Contractor shall be responsible for personal air monitoring to document compliance of their workers with OSHA regulations using the methods as reiterated below.
 - b. The analysis laboratory performing this work shall be an independent party not financially or managerially connected to the contractor.
 - c. The laboratory shall be successfully participating in the American Industrial Hygiene Association (AIHA) NIOSH Proficiency Analytical Testing (PAT) program.
 - d. Air sampling materials and equipment requirements are as follows:
 - 1) Personal sampling shall be performed pursuant to NIOSH Method 7400, phase contrast microscopy.
 - 2) The filter assembly shall be upstream of all other components in the sampling train. An airflow-measuring device (when used) shall be downstream of the filter and the pump assembly, or integral with the pump assembly.
 - 3) Sampling pumps shall supply constant flow.

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- 4) An airflow measuring/metering device shall be used, and shall be high quality rotameter, mass flow, dry gas meter, or critical orifice. Measuring devices shall have a range of at least 1.5 times the desired flow rate and be readable to at least +or -5 % of the desired flow rate. They shall be calibrated against standards of higher accuracy before and after sampling. The calibrations shall be recorded.
- 5) Numbers and frequencies of personal air sampling shall be as required by OSHA regulations but not less than (1) sample per eight (8) hour work shift during times of asbestos removal work.
- 6) Results of sample analysis shall be provided to the Consultant within twenty four (24) hours of collection.
- 7) All other air sampling for compliance with the Specifications shall be performed by the Consultant at no cost to the Contractor except where the Contractor fails specified tests.
- 8) Use a pre-approved "chain of custody" form for all personal air samples collected.

1.11 QUALITY ASSURANCE

A. Notifications, Permits, Warning signs, Labels, and Posters:

1. Provide the required written pre-notification to EPA, SDAPCD, CAL/OSHA, and any other regional, state, and local authority having jurisdiction over the project. Copies of the pre-notifications shall be delivered to the Consultant before any work begins. The Contractor must secure all other permits required for the work, including disposal of asbestos in an approved landfill.
2. Provide the necessary follow-up notices that may be required, obtain all permits, and pay all governmental taxes, fees and other costs in connection with his work. File all necessary drawings, prepare all documents, and obtain all necessary approvals of all governmental departments having jurisdiction.
3. Include in the work, without extra compensation, all labor, materials, services apparatus, to comply with all applicable laws, ordinances, rules, and regulations.
4. All materials and work shall comply with the specifications of the National Fire Protection Association (NFPA), California Electrical Code (CEC), Underwriters Laboratories (UL), local utility companies, and the County Department of Health, with the California Building Code, and Contract requirements that are in excess of the applicable codes, rules, or regulations. The contract provisions shall be given precedence, unless special permission is granted by the Consultant.
5. Comply with the requirements of the federal, state, and local regulations related to asbestos as listed in herein.
6. Erect OSHA-specified warning signs around the workspace and at every point of potential entry from the outside including the entrance to the decontamination facility's clean room. The signs shall conform to OSHA requirements with the words "Danger, Asbestos Hazard, and Do Not Enter." The warning signs shall be a bright color so that they can be easily noticed. The size of the sign and its lettering shall be no less than OSHA requirements.

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7. Provide OSHA and DOT-required labels as well as NESHAPS labeling requirements for all plastic bags and drums utilized to transport contaminated material from the work areas to the EPA approved disposal landfill.
8. Provide any other signs, labels, warnings, and posted instructions that are necessary to protect, inform and warn workers and visitors of the hazard from asbestos exposure. Also, post in a prominent and convenient place (i.e. the clean room of the decontamination facility) for worker's use a copy of the latest applicable regulations of OSHA, EPA, and NIOSH; and a copy of these Specifications.

B. Electrical Safety Requirements:

1. The non-current carrying parts of fixed, portable, and plug-connected equipment shall be grounded. Portable tools and appliances protected by an approved system of double insulation need not be grounded. All light and power circuits in asbestos removal areas shall be ground fault protected.
2. Extension cords shall be the 3-wire type, shall be protected from damage, and shall not be fastened with staples, hung from nails, or suspended from wires. Splices shall have soldered wire connections with insulation equal to the cable. Worn or frayed cords shall not be used.
3. Safe lighting equipment shall be provided with a preference for floodlights rather than indiscriminate use of unprotected lamps hung from temporary wiring. Exposed bulbs shall be guarded to prevent accidental contact. Temporary wiring shall be properly insulated and substantially supported. Circuits shall be designed and fused. All temporary lighting inside the asbestos work area shall be waterproofed.
4. Receptacles for attachment plugs shall be approved, concealed contact type. Where different voltages, frequencies, or types of current are supplied, receptacles shall be of such design that attachment plugs are not interchangeable.
5. Each disconnecting means for motors and appliances and each service feeder or branch circuit at the point where it originates shall be legibly marked to indicate its purpose.
6. Coordinate all power requirements with the District, including ground fault interrupted (GFI) panel design and extension cord requirements.

C. Scaffolding, Rigging, and Hoisting:

1. Unless otherwise specified, provide all scaffolding, rigging, hoisting, and other services necessary to complete the Work.
2. Remove all equipment from the project site when no longer required, unless written authorization is given by the District and/or Consultant.

D. Emergency Precautions:

1. Establish emergency and fire exits from the work area for the workers. All emergency exits that must pass through a work area shall be equipped with two (2) full sets of protective clothing and respirators at all times.

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2. Notify only the District and parties that are required by law to be notified. District and Consultant shall determine if any agencies other than those required by the law shall be notified.
3. Be prepared to administer appropriate first aid to injured personnel at the site after decontamination. Seriously injured personnel shall be treated immediately in the work area or evacuated without performing decontamination. When an injury occurs, stop work and implement fiber reduction techniques (e.g., water spraying) until the injured person has been removed from the work area.

PART 2 - PRODUCTS

2.1 GENERAL

- A. No materials, equipment, or tools belonging to the District shall be used by the Contractor, except in case of an emergency and upon explicit authorization by the District.
- B. Deliver all materials and equipment to the site in the original containers bearing the name of the manufacturer and details for proper storage and usage.
- C. All materials or equipment delivered to the site shall be unloaded, temporarily stored, and transferred to the work area in a manner, which shall not interfere with operations of the District.
- D. The District and/or Consultant must approve unloading and temporary storage sites and transfer routes in advance.
- E. Damaged or deteriorated materials may not be used and must be promptly removed from the project site. Materials, that have become contaminated by asbestos-containing materials shall be packaged as ACM, and disposed of in an approved, secure asbestos landfill.
- F. All materials, tools, and equipment must comply at a minimum with this specification and all applicable federal, state, and local regulations.

2.2 MATERIALS

- A. Plastic Sheeting: Sheet shall be fire-retardant polyethylene sized in lengths and widths to minimize the frequency of joints. The minimum thickness shall be that which prevents release of asbestos through tearing, separation, or other reasonably foreseeable means, and in no case shall be thinner than:
 1. 6-mil thick (0.15 mm) for use as wall and floor barriers.
 2. 4-mil thick for use as ceiling barriers and for all other uses.

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- B. Plastic Bags: Bags shall be 6-mil (0.15 mm) minimum polyethylene, or sufficiently thicker for large bags so as to prevent release of asbestos through tearing, separation or other reasonably foreseeable means and shall be labeled with OSHA asbestos warning or capable of being so labeled.
- C. Tape: Tape shall be capable of sealing joints of adjacent sheets of plastic and of attaching plastic sheet to finished or unfinished surfaces of dissimilar materials, and shall be capable of adhering under dry and wet conditions, including wetting by amended water.
- D. Glue: Glue shall be capable of sealing plastic to finished surfaces without damaging the surfaces when removed. Mist or water, encapsulating agent, or any other materials to be used in the work area must not affect the bonding strength and resulting seal integrity.
- E. Surfactants (Wetting Agents): Surfactants shall be used so as to produce a material that result in wetting of the asbestos-containing material and retardation of fiber release during disturbance of the material equal to or greater than that provided by the use of one ounce of a surfactant consisting of 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with five gallons of water. Surfactants shall be certified by their manufacturer as complying with EPA regulations controlling the use of volatile organic compounds, and such State and local regulations under an EPA-approved State Implementation Plan.
- F. Encapsulants: Encapsulants shall be classified or certified by Underwriters Laboratories, and shall not degrade the function of any replacement material. They shall be certified by their manufacturer as complying with EPA regulations controlling the use of volatile organic compounds, and such State and local regulations under an EPA-approved State Implementation Plan. For use with fireproofing, any replacement fire-resistive assembly including an encapsulant shall meet the requirements of this specification and existing building requirements, whichever are more stringent, and:
 - 1. Bulk encapsulants. When used as a bulk encapsulant (penetrating or bridging) on fireproofing, the combination of encapsulant and specific fireproofing (trade name) to which it is applied shall be classified or certified by Underwriters Laboratories, and have a maximum flame spread value of 5 or 10 for exposed or concealed fireproofing, respectively, and smoke developed value of 0, when tested in accordance with ASTM Method E 84 or UL Standard 723.
 - 2. Lock-down (post-removal) encapsulants. When used as a lock-down (post-removal) encapsulant on a surface after removal of asbestos-containing material, the encapsulant must be classified or certified by UL for use with the specific fireproofing material (trade name) and applied at the specified rate of application.
- G. Asbestos disposal packaging: Packaging shall be suitable to receive and retain any asbestos-containing materials until disposal or conversion at an approved site. The packaging shall be both air and watertight.
 - 1. Labeling. Packaging of asbestos-containing material shall be labeled in accordance with regulations of EPA (e.g., 40 CFR 61.150), OSHA (e.g., 29 CFR

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- 1926.1101, 8 CCR 1529), DOT (e.g., 49 CFR 172.400, 172.446; except for limited quantity shipments which are not being shipped by air (49 CFR 172.203, 173.155), and State or local occupational safety and health, or environmental agencies (where applicable).
2. Marking. Packaging of asbestos-containing material shall be marked in accordance with DOT regulations (e.g., 49 CFR 172.300); except for limited quantity shipments (49 CFR 172.301).
- H. Warning Signs: Signs shall be as required by EPA (e.g., 40 CFR 61.150), OSHA (e.g., 29 CFR 1926.1101, 8 CCR 1529), State occupational safety and health or environmental agencies (where applicable), and this contract.
- I. Glove bags: Bags shall be made of 10 10-mil (0.25 mm) minimum clear polyethylene. Bag shape shall include "shoulders" to be used with straps. Sizes and shapes chosen shall be suitable for the pipe and fitting formations included in this contract. The bags shall have a closure system, such as a double zipper or self-closing cloth strip. The bags shall have a zipper lock or equivalent feature, which seals the lower part of the bag from the top part to remove asbestos- containing debris.
- J. Brushes: All brushes shall have nylon bristles. Wire brushes are excluded from use due to their potential to shred asbestos fibers into smaller fibers. Wire brushes may be used on pipe joint insulation and flooring mastics upon prior written approval from the District and Consultant.

2.3 TOOLS AND EQUIPMENT

- A. Airless Sprayer: Amended water and surface sealers shall be applied with an airless or other low-pressure sprayer suitable for the specific application.
- B. HEPA-Filtered Exhausts: Air inside the asbestos removal area shall be exhausted to the atmosphere (i.e. building exterior) through a High Efficiency Particulate Air (HEPA) filter.
1. A sufficient number of HEPA-filtered portable exhaust units shall be provided for each work area in order to provide:
 - a. At least four (4) complete changes of air per hour;
 - b. An inward velocity through all openings of at least 200 fpm;
 - c. A static negative pressure of at least 0.02 inches of water.
 2. The HEPA-filter shall be preceded by replaceable pre-filters and the unit must be designed such that it cannot be operated unless the HEPA-filter is in place.
 3. The units must be designed with lights and alarms that indicate that the filters are properly installed and function and that determine when the filters must be changed.
 4. Flexible metal or similar materials hose(s) (e.g. ducts) of sufficient length must also be provided to allow the units to discharge to the exterior of the building.

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- C. Vacuum Equipment: All vacuum equipment used for cleaning up shall be HEPA-filtered. At least one HEPA vacuum shall be equipped with floor (hard surface and carpet) cleaning attachments.
- D. Scaffolding/Staging/Ladders: Shall meet OSHA safety regulations, including 29 CFR 1926.450-452. Where electrical power and water are used inside a work area, no electrically conductive ladders (e.g., aluminum or steel) shall be used (except for hinges and feet).
- E. Transportation: Transportation methods shall comply with the provisions of EPA Title 40, Part 61, Subparts A, and B and with any hazardous or special waste regulations for temporary storage, transport, and disposal if such codes are enforced in states or cities where the waste will be generated, stored, transported, or disposed of. All containers shall be labeled in accordance with 8 CCR 1529, 29 CFR 1926.58(K) (2), 40 CFR 61, Subparts A and M, and 49 CFR Parts 171 and 172, Hazardous Waste Substances: Final Rule.
- F. Other Tools and Equipment: Furnish all equipment such as lumber, nails, ladders, HEPA vacuums, and hardware and supplies, which may be required to construct and dismantle the decontamination areas and the barriers that isolate the work area. Provide other suitable tools for the abatement activities including hand scrapers, wire brushes, sponges, mops, and shovels.
- G. Electrical: Electrical tools and equipment shall meet all applicable codes and regulations, including, in particular, 8 CCR 1760, 29 CFR 1910.304 and 29 CFR 1926.400-449.
 - 1. Grounding. Ground fault circuit-interrupters shall always be used for all electrical equipment, except to the extent provided in an assured equipment grounding conductor program, 29 CFR 1926.404, if established and implemented in the Plan of Action.
 - 2. Additional requirements. Other OSHA requirements for equipment grounding conductors, beyond those described in the grounding paragraph, apply.

PART 3 - EXECUTION

3.1 WORK AREA PREPARATION

- A. Prepare the work area as described in this section. Preparation work shall be performed according to the following general sequence of steps and procedures to insure that proper containment and protection systems are installed prior to any work, which could generate airborne asbestos fibers:
 - 1. Remove and relocate any non-fixed items (not removed by the District) to storage areas designated by the District.

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2. HVAC: Isolate, clean by HEPA vacuuming and washing, and seal airtight with plastic and tape all HVAC system diffuses, grills, and registers in or servicing the work area.
 3. Pre-cleaning: Carefully clean all surfaces in the work area that may be contaminated with any dust or debris by using wet methods and a vacuum equipped with a HEPA filter. Comply with Article "Pre-Cleaning of Asbestos Contaminated Surfaces."
 4. Isolate all electrical systems as directed by the District and provide temporary power and lighting as required for the work area and affected non-work areas. Comply with Article "Electrical Systems."
 5. Barriers: Cover any window or other opening with polyethylene sheeting. All walls to remain shall also be protected from damage during the work and erect or install Decontamination Facility and HEPA exhaust system.
 6. Installation of Decontamination System: Install the decontamination enclosure system.
 7. Signage: Post adequate warning signs denoting the potential danger of airborne asbestos at designated entrances to work areas including, as a minimum, those described at 29 CFR 1926.1101, 8 CCR 1529, and State occupational safety and health and fire safety regulations (where applicable). Prevent access to posted areas by unauthorized or inadequately protected persons.
 8. Fire equipment: Adequate portable fire extinguisher equipment shall be maintained within the work area meeting at least the requirements of 8 CCR 1922, 29 CFR 1910.157 and (where applicable) State occupational safety and health regulations and fire safety regulations.
- B. Obtain Consultant's approval of all preparation work before starting removal of asbestos material.

3.2 ELECTRICAL SYSTEMS

- A. The scope of the required electrical isolation and protection work includes isolation and protection of electrical equipment, which is in the area from which asbestos must be removed, and could therefore possibly become a hazard through contact or water spray short-circuiting. Shutdown of electrical circuits shall include providing labor to monitor, inspect, and service temporary power circuits, lighting, and equipment as required by local codes and regulations. Provide "Lock Out" system on all electrical panels or equipment that will be shut off during the removal process.
- B. Provide temporary lighting in the work area where asbestos removal is performed. Inspect the removal work area for the condition of electrical conduit and junction boxes. Correct all potentially unsafe conditions. Do not proceed with removal work until all potentially unsafe conditions have been corrected.
- C. All materials and workmanship shall conform to the latest editions of the following codes, standards, and specifications:
1. California Electrical Code (CEC) - current edition.
 2. National Bureau of Standards, Handbook H30, National Electrical Safety Code.

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3. State and Local codes, and all other authorities having jurisdiction.
 4. Underwriter Laboratories (UL).
 5. National Board of Fire Underwriters.
 6. California-OSHA.
- D. Temporary lighting and power systems shall meet or exceed all OSHA, state, and local regulations; temporary lighting levels shall meet or exceed OSHA requirements and provide surface lighting for nighttime work.
- E. Visit the site as necessary to investigate existing electrical conditions and isolation requirements.
- F. Prior to switching circuits at panels, review the existing directory. Do not shut down any circuits without advanced notification and approval of the District.
- G. All costs associated with the isolation of electrical systems and installation of temporary power and lighting shall be borne by the Contractor.
- H. Comply with all applicable electrical safety regulations.

3.3 PRE-CLEANING OF ASBESTOS CONTAMINATED SURFACES

- A. Cleaning of surfaces that are potentially contaminated with asbestos-containing dust and debris shall be required to prevent this dust from becoming airborne and posing an exposure risk, or interfering with perimeter air monitoring activities. Cleaning action shall be performed as a preliminary exposure control procedure, prior to performing other actions associated with the Work.
- B. Cleaning shall consist of HEPA vacuuming followed by wet mopping or wiping of surfaces in a manner that prevents dust generation, but effectively rids the surface of all visible debris, dust, film, and grime.
- C. Each HEPA vacuum shall be separately equipped with an airtight, securely attached hose of appropriate length and a collection wand, brush or other special attachment appropriate to the required cleaning task. The equipment shall be operable at all times and shall contain no air leaks. The Consultant will review verification of the efficiency of the equipment's filtration (i.e. manufacturer's equipment data sheets).
- D. Cleaning Procedures:
1. Remove large pieces of debris by hand, and then dry vacuum all surfaces using HEPA filtered equipment and a collection attachment that minimizes dust generation.
 2. Lightly wet the surface of any material that produces airborne fibers using an airless sprayer and amended water.
 3. Collect, package, label, and dispose of vacuumed material as asbestos-contaminated waste.

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4. Thoroughly wet wipe or mop all surfaces to remove any remaining dirt or grime, being careful not to wet or damage any electrical equipment, furniture, or other sensitive surfaces.
5. All surfaces to completely dry, then inspect the surfaces for any visible remaining dirt or fibrous material.
6. HEPA vacuum any remaining dirt or grime using an efficient collection attachment.
7. Collect and pump all wastewater through a 5-micron filter, utilizing a multistage filtration system. Dispose of filtered material and filter as asbestos waste.
8. Request that the Consultant perform a visual inspection of the cleaning work, prior to continuing any other specified actions.

3.4 ISOLATION OF OSHA CLASS I (FRIABLE) CONTAINMENT WORK AREAS

A. Work Area Isolation and Protection for Friable Asbestos-Containing Materials:

1. Isolate the work area for the duration of work by completely closing and sealing all openings and doorways into the work area, including heating and ventilation ducts, doorways, windows, floors and ceiling penetrations, and lighting. Isolation/sealing shall be accomplished by using two (2) layers of 6-mil plastic sheeting taped securely in place, or by caulking, including the construction as noted in numbers 4 and 5 below. The work area shall be protected and sealed airtight to the extent possible, and be subject to the approval of the Consultant.
2. Emergency and fire exits shall be maintained.
3. Shutdown and isolate heating, cooling and ventilating air systems to prevent contamination and fiber dispersal to other areas of the property.
4. Thoroughly pre-clean all dust or debris from any fixed objects, floors, walls, or other equipment within the work area using HEPA vacuuming equipment and wet washing. Do not use dry brooms, brushes, mops, or non-HEPA vacuum cleaners for this pre-cleaning work. Seal all seams, joints, covers, or casings with tape, and enclosed fixed objects or equipment with a minimum of two layers of 6-mil plastic sheeting secured and sealed airtight with duct tape.
5. Cover floor and walls with a minimum two (2) independent layers of 6-mil plastic sheeting, turning each layer up onto walls a minimum of 16" and fasten securely to wall. Cover walls with two (2) layers of 6-mil plastic sheet extending to floor, overlapping the two (2) floor sheets by not less than 12" excluding the turn-up. All joints in plastic sheets shall be taped and glued in a manner to prohibit air movement, and to prevent passage of water or other liquids. The bottom layer of floor poly shall be securely fastened to the floor to prevent creases or slippage that would pose a hazard to workers. Any floor drains or other openings shall be sealed individually with two (2) layers of 6-mil sheeting and tape, and then covered by the remaining two (2) layers of poly. Pits, pumps, and other openings shall be covered to prevent a tripping hazard and then covered with two (2) layers of 6-mil sheeting.
6. Install work area HEPA-filtered exhaust systems as previously specified in Section 1.6 (J) of these Specifications.
7. Post warning signs in English and Spanish meeting the requirements of 8 CCR 1529 (k)(7) and OSHA 29 CFR 1926.58 (k)(1) and (k)(2)(ii) at the outside

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doorway to the decontamination facility which shall be the only non-emergency entrance into the work area. The Consultant may also request that the Contractor post additional warning signs around the work area or at other potential entrances or exposure points in accordance with California Proposition 65.

8. Warning signs shall be readily visible to any person attempting to enter the work area.
9. All waste shall be disposed of as hazardous waste and packaged as specified herein.
10. Negative pressure will be established in the work area by placement and operation of sufficient number of HEPA-filtered portable exhaust units in order to provide:
 - a. At least four (4) complete changes of air per hour;
 - b. An inward velocity through all openings of at least 200 fpm;
 - c. A static negative pressure of at least 0.02 inches of water.
11. Negative pressure shall be measured and recorded using a pressure differential monitor (manometer or magnehelic-type). The monitor shall be calibrated according to the manufacturer specifications and equipped with a printer.

- B. After the friable asbestos removal work area has been prepared as specified above, request a formal site inspection by the Consultant. No removal, demolition or other disturbance of asbestos-containing material, dust, or debris shall occur until the Consultant has inspected and approved the site preparation work.

3.5 ISOLATION OF OSHA CLASS II (NON-FRIABLE) CONTAINMENT WORK AREAS

- A. Work Area Isolation and Protection of Non-Friable Asbestos-Containing Materials Located on the Interior of a Building:

1. Isolate the work area for the duration of work by completely closing and sealing all openings and doorways into the work area, including heating and ventilation ducts, doorways, windows, floors and ceiling penetrations, and lighting. Isolation/sealing shall be accomplished by using two (2) layers of 6-mil plastic sheeting taped securely in place, or by caulking. The work area shall be protected and sealed airtight to the extent possible, and be subject to the approval of the Consultant.
2. Emergency and fire exits shall be maintained.
3. Shutdown and isolate heating, cooling and ventilating air systems to prevent contamination and fiber dispersal to other areas of the property.
4. Thoroughly pre-clean all dust or debris from any fixed objects, floors, walls, or other equipment within the work area using HEPA vacuuming equipment and wet washing. Do not use dry brooms, brushes, mops, or non-HEPA vacuum cleaners for pre-cleaning work.
5. Seal all seams, joints, covers, or casings with tape, and enclosed fixed objects or equipment with a minimum of two layers of 6-mil plastic sheeting secured and sealed airtight with duct tape.

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6. Cover walls with one (1) layer of 6-mil plastic sheet extending a minimum of four feet from floor (splashguards). All joints in plastic sheets shall be taped and glued in a manner to prohibit air movement, and to prevent passage of water or other liquids.
 7. Any floor drains or other openings shall be sealed individually with two (2) layers of 6-mil sheeting and tape. Pits, pumps, and other openings shall be covered to prevent a tripping hazard and then covered with two (2) layers of 6-mil sheeting.
 8. Install work area HEPA-filtered exhaust systems as previously specified herein.
 9. Post warning signs in English and Spanish meeting the requirements of 8 CCR 1529 (k)(7) and OSHA 29 CFR 1926.58(k)(1) and (k)(2)(ii) at the outside doorway to the decontamination facility which shall be the only non-emergency entrance into the work area.
 10. Warning signs shall be readily visible to any person attempting to, enter the work area.
 11. All waste will be disposed of as non-hazard waste and packaged as specified herein.
- B. Work Area Isolation and Protection of Non-Friable Asbestos-Containing Roofing Materials:
1. Install plastic sheeting, for use as drop cloths, around the perimeter of the building, where necessary.
 2. Post warning signs in English and Spanish meeting the requirements of 8 CCR 1529 (k)(7) and OSHA 29 CFR 1926.58(k)(1) and (k)(2)(ii) at the edges of the plastic sheeting and at the access point to the roof.
 3. Warning signs shall be readily visible to any person attempting to access the roof of the building.
 4. Isolate roof level heating and ventilation air intake sources or shall arrange with the District to have the ventilation system shut down. The work area shall be subject to the approval of the Consultant.
 5. Seal all seams, joints, covers, or casings with tape, and enclosed fixed objects or equipment with a minimum of two layers of 6-mil plastic sheeting secured and sealed airtight with duct tape.
- C. Work Area Isolation and Protection of Outdoor Non-Friable Asbestos-Containing Cementitious Asbestos-Containing Siding, Shingles, or Transite Panels.
1. Install plastic sheeting, for use as drop cloths, around the perimeter of the building, where removal is to occur.
 2. Post warning signs in English and Spanish meeting the requirements of 8 CCR 1529 (k)(7) and OSHA 29 CFR 1926.58(k)(1) and (k)(2)(ii) at the edges of the plastic sheeting.
 3. Warning signs shall be readily visible to any person approaching the work area.
 4. Isolate the work area from the interior of the building by completely closing and sealing all openings and doorways from the work area into the building, including heating and ventilation ducts, doorways, and windows. The work area shall be subject to the approval of the Consultant.

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5. Seal all seams, joints, covers, or casings with tape, and enclosed fixed objects or equipment with a minimum of two layers of 6-mil plastic sheeting secured and sealed airtight with duct tape.
- D. After the non-friable asbestos removal work area has been prepared as specified above, request a formal site inspection by the Consultant. No removal, demolition or other disturbance of asbestos-containing material, dust, or debris shall occur until the Consultant has inspected and approved the site preparation work.

3.6 ISOLATION OF ACCM REMOVAL AREAS

A. Work Area Isolation and Protection of Asbestos-Containing Materials:

1. For interior work areas, isolate the work area for the duration of work by completely closing and sealing all openings and doorways into the work area, including heating and ventilation ducts, doorways, windows, floors and ceiling penetrations, and lighting. Isolation shall be accomplished by using one (1) layer of 6-mil plastic sheeting taped securely in place, or by caulking, including the construction as noted in number 2 below. The work area shall be protected and sealed airtight to the extent possible, and be subject to the approval of the Consultant.
2. For exterior work areas, seal all openings and doorways to the interior of the building within the work area, including heating and ventilation ducts, doorways, windows, floors and ceiling penetrations, and lighting. Isolation shall be accomplished by using one (1) layers of 6-mil plastic sheeting taped securely in place, or by caulking. The work area shall be segregated from the interior of the building, to the extent possible, and be subject to the approval of the Consultant.
3. Emergency and fire exits shall be maintained.
4. Shutdown and isolate heating, cooling and ventilating air systems to prevent contamination and fiber dispersal to other areas of the property.
5. Cover floor with one layer of 6-mil plastic sheeting, to serve as a drop cloth.
6. Post warning signs in English and Spanish meeting the requirements of 8 CCR 1529 (k)(7) and OSHA 29 CFR 1926.58(k)(1) and (k)(2)(ii) at the entry to the work area which shall be the only non-emergency entrance into the work area.
7. Warning signs shall be readily visible to any person attempting to, enter the work area.
8. All waste will be disposed of as construction debris and packaged as specified herein.
9. Intact ACCM may be left on or in a building during demolition operations if the ACCM Removal Operations listed specified herein are followed throughout the course of the building demolition

- B. After the ACCM removal work area has been prepared as specified above, request a formal site inspection by the Consultant. No removal, demolition or other disturbance of asbestos-containing construction material, dust, or debris shall occur until the Consultant has inspected and approved the site preparation work.

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3.7 REMOVAL PROCEDURES FOR ALL OPERATIONS

- A. Vacuum cleaners equipped with HEPA filters shall be used to collect all debris and dust containing ACM and PACM.
- B. Wet methods shall be used to control exposure during any asbestos handling, removal, cutting, and clean-up, unless the Contractor can demonstrate that the use of wet methods is infeasible due to (for example) creation of an electrical hazard or safety hazard during roofing abatement. Any exceptions to the requirement for wet methods must be approved in advance by the District or Consultant.
- C. Waste and debris contaminated with asbestos must be promptly cleaned-up and stored in leak-tight containers or impermeably wrapped.

3.8 OSHA CLASS I (FRIABLE) REMOVAL PROCEDURES

- A. Friable materials may include the removal of floor tile and adhesive by mechanical methods.
- B. Amended water (wetting agent) mixed and carefully applied using an airless sprayer as specified by the manufacturer, shall continuously be used to control the release of asbestos fibers from the material prior to and during removal. The amended water shall be applied in sufficient quantity to fully penetrate and saturate the material before it is removed. Wetting shall commence up to 24 hours before removal work to ensure effectiveness.
- C. Removal Methods:
 - 1. No asbestos removal work shall begin until the work area has been prepared and approved by the Consultant.
 - 2. Removal workers shall wear minimally half face air-purifying respirators with P-100 filters and protective clothing as previously described throughout all removal, cleanup, and waste handling operations.
 - 3. Small test patches of asbestos material shall be wetted, and then removed and examined by the Consultant and Supervisor to determine degree of saturation prior to removing the bulk of the material. With prior approval, the Contractor may use removal encapsulants instead of amended water; applied per manufacturer's and federal guidelines.
 - 4. After large areas of the asbestos material have been fully wetted and tested, the asbestos shall be carefully removed in small sections by using hand scrapers or other suitable tools or mechanical devices as allowed by federal, state, and local regulations. This includes chemical removal of floor tile mastic in association with mechanical buffers and/or use of a bead blaster.
 - 5. As the material is removed, it shall be promptly wetted and packed into impermeable, labeled 6-mil polyethylene, disposal bags. When each bag is full, the packaged material shall be sprayed with amended water, sealed (using duct tape or other fastener as approved by the Consultant), and transported to a temporary storage area inside the work area.

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6. Repeatedly spray the material to prevent it from drying out.
 7. After obtaining written approval of the cleaning from the Consultant, seal all substrate surfaces from which asbestos material was removed with at least one (1) coat of an approved penetrating encapsulant.
 8. Minimize contamination of the work floor, the exterior of disposal containers, and all other surfaces within the work area. At the end of each shift, all surfaces shall be cleaned of all materials and then HEPA vacuumed or wet mopped.
 9. Workers must enter and exit the regulated work area through a decontamination facility. The decontamination facility and work area entry/exit procedures must meet the requirements of 9 CCR 1529 (j)(1).
 10. The decontamination facility shall be wet cleaned (a minimum of two times) using wet cleaning methods upon completion of any waste removal when the worker decontamination facility's shower room alternates as a waste container wash room. The shower room shall be washed with cloths or mops saturated with a detergent solution immediately prior to wet cleaning.
 11. The decontamination facility shall be wet cleaned and HEPA vacuumed, as appropriate, after each shift change and meal break.
 12. Excessive water accumulation or flooding in the work area shall require work to stop until the water is collected and disposed of properly.
- D. Upon completion of removal work, but prior to commencing encapsulation or post-removal cleaning of the work area, request the Consultant conduct an inspection and approve the removal work.

3.9 OSHA CLASS II (NON-FRIABLE) REMOVAL PROCEDURES

- A. Non-friable friable materials may include floor tile and adhesive removed by hand tools.
- B. Amended water (wetting agent) mixed and carefully applied using an airless sprayer as specified by the manufacturer, shall continuously be used to control the release of asbestos fibers from the material prior to and during removal. The amended water shall be applied in sufficient quantity to fully saturate the material before it is removed. Wetting shall commence up to 24 hours before removal work to ensure effectiveness.
- C. Removal Methods:
1. No asbestos removal work shall begin until the work area has been prepared and approved by the Consultant.
 2. Removal workers shall wear minimally half face air-purifying respirators with P-100 filters and protective clothing as previously described throughout all removal, cleanup, and waste handling operations.
 3. Small test patches of asbestos material shall be wetted, and then removed and examined by the Consultant and Supervisor to determine degree of saturation prior to removing the bulk of the material. With prior approval, the Contractor may use removal encapsulants instead of amended water; applied per manufacturer's and federal guidelines.
 4. After large areas of the asbestos material have been fully wetted and tested, the asbestos shall be carefully removed in small sections by using hand scrapers or

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other suitable hand tools. No tools or equipment shall be used to render material friable without prior approval by District. Floor tile and mastic will be removed with hand tools and wet methods.

5. As the material is removed, it shall be promptly wetted and packed into impermeable, labeled 6-mil polyethylene, disposal bags. When each bag is full, the packaged material shall be sprayed with amended water, sealed (using duct tape or other fastener as approved by the Consultant), and transported to a temporary storage area inside the work area.
6. Material shall not be dropped or thrown to the ground. Removed asbestos-containing roofing material, siding, panels, or shingles shall be passed to the ground by hand or lowered to the ground via a covered, dust-tight chute, crane, or hoist.
7. Repeatedly spray the material to prevent it from drying out.
8. After obtaining written approval of the cleaning from the Consultant, seal all substrate surfaces from which asbestos material was removed with at least one (1) coat of an approved penetrating encapsulant.
9. Minimize contamination of the work floor, the exterior of disposal containers and all other surfaces within the work area. At the end of each shift, all surfaces shall be cleaned of all materials and then HEPA vacuumed or wet mopped.
10. Workers must enter and exit the regulated work area through a decontamination facility. The decontamination facility and work area entry/exit procedures must meet the requirements of 29 CCR 1529 (j)(2).
11. The decontamination facility shall be wet cleaned (a minimum of two times) using wet cleaning methods upon completion of any waste removal when the worker decontamination facility's shower room alternates as a waste container wash room, the shower room shall be washed with cloths or mops saturated with a detergent solution immediately prior to wet cleaning.
12. The decontamination facility shall be wet cleaned and HEPA vacuumed, as appropriate, after each shift change and meal break.
13. Excessive water accumulation or flooding in the work area shall require work to stop until the water is collected and disposed of properly.

D. Upon completion of removal work, but prior to commencing encapsulation or post-removal cleaning of the work area, request the Consultant conduct an inspection and approve the removal work.

E. All asbestos-containing materials shall be removed, gross debris cleaned up, and waste bags removed from the work area prior to approval from the Consultant.

3.10 ACCM REMOVAL PROCEDURES

A. Amended water (wetting agent) mixed and carefully applied using an airless sprayer as specified by the manufacturer, shall continuously be used to control the release of asbestos fibers from the material prior to and during removal. The amended water shall be applied in sufficient quantity to fully saturate the material before it is removed. Wetting shall commence up to 24 hours before removal work to ensure effectiveness.

B. Removal Methods:

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1. No asbestos removal work shall begin until the work area has been prepared and approved by the Consultant.
 2. Removal workers shall wear half face air-purifying respirators with P-100 filters and protective clothing as previously described throughout all removal, cleanup, and waste handling operations.
 3. Small test patches of asbestos material shall be wetted, and then removed and examined by the Consultant and Supervisor to determine degree of saturation prior to removing the bulk of the material. With prior approval, the Contractor may use removal encapsulants instead of amended water; applied per manufacturer's and federal guidelines.
 4. After large areas of the asbestos material have been fully wetted and tested, the asbestos shall be carefully removed in small sections by using hand scrapers or other suitable hand tools. No tools or equipment shall be used to render material friable without prior approval by District. Floor tile and mastic shall be removed with hand tools and wet methods.
 5. As the material is removed, it shall be promptly wetted and packed into impermeable, labeled 6-mil polyethylene, disposal bags. When each bag is full, the packaged material shall be sprayed with amended water, sealed (using duct tape or other fastener as approved by the Consultant), and transported to a temporary storage area inside the work area.
 6. Repeatedly spray the material to prevent it from drying out.
 7. Minimize contamination of the work floor, the exterior of disposal containers and all other surfaces within the work area. At the end of each shift, all surfaces shall be cleaned of all materials and then HEPA vacuumed or wet mopped.
 8. The decontamination facility shall be wet cleaned (a minimum of two times) using wet cleaning methods upon completion of any waste removal when the worker decontamination facility's shower room alternates as a waste container wash room, the shower room shall be washed with cloths or mops saturated with a detergent solution immediately prior to wet cleaning.
 9. Excessive water accumulation or flooding in the work area shall require work to stop until the water is collected and disposed of properly.
- C. Upon completion of removal work, but prior to commencing encapsulation or post-removal cleaning of the work area, request the Consultant conduct an inspection and approve the removal work.

3.11 CLEANING AND FINAL DECONTAMINATION

- A. After all asbestos-containing (or contaminated) materials have been removed, remove all wastes and perform a thorough multi-stage final cleanup and decontamination of the work area per the methods indicated below. Final cleaning shall be performed only after all waste is packaged and removed, but prior to re-installing equipment or dismantling any barriers, decontamination facility, or protective coverings. Cleaning shall be performed before a visual inspection and air testing by the Consultant. HEPA-exhaust systems shall operate continuously throughout the cleaning and air testing process until the Consultant authorizes their shutdown and removal from the site. Notify the Consultant at least 24 hours in advance of the expected completion time of site cleaning in order to allow the scheduling of air clearance testing.

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- B. Methods and Approvals: Cleaning methods and approvals shall consist of the following tasks performed in the list order:
1. Remove all visible accumulations of asbestos debris on the protective coverings on floors, walls, and other surfaces, and then HEPA vacuum all surfaces to pick up excess water and gross saturated debris.
 2. After HEPA vacuuming, the work area air shall be lightly misted (with amended water), and then all protective coverings on ceilings, walls, floors, and other items in the work area shall be wiped thoroughly clean (first cleaning).
 3. After completing the above steps (1) and (2), request the Consultant to inspect the site. To facilitate scheduling of this inspection, notify the Consultant of the anticipated completion time of the above initial cleaning work 24 hours in advance.
 4. If the Consultant observes any asbestos waste or fibers within the work area during the inspection, perform additional cleanup and decontamination as directed by the Consultant.
 5. If the Consultant approves this first cleaning, slowly remove the upper layer of all protective poly coverings on floors, walls, and other surfaces and package them in 6-mil waste bags. The waste bags shall then be removed from the work area. The bottom layer of protective poly coverings, the decontamination facilities, the HEPA exhaust systems, all barrier walls, and seals on HVAC components shall remain in place and in use.
 6. After these upper protective coverings are moved, the work area shall be completely wet wiped and vacated for at least twelve (12) hours to allow fiber settling and while the Consultant collects and analyzes a final set of air samples according to NIOSH Method 7400 (PCM).
 7. Upon obtaining the Consultant's written approval of final clean work area as specified herein, unless otherwise permitted, drying time shall be as specified by the manufacturer before final air sampling is conducted.
 8. After successful completion of final air clearance testing as specified herein, carefully remove in listed order the decontamination facilities, any temporary barrier walls or tunnels, seals on HVAC components. The HEPA exhaust systems shall be removed only after all other items are removed. A HEPA vacuum shall be kept on site during this final disassembly work to cleanup any dust or debris.
 9. If any of the post cleaning PCM air sample results are above 0.01 fiber/cc (or a preexisting level of normal background fibers if shown to be higher than 0.01 f/cc by the Consultant), the Consultant may require additional cleaning, decontamination, air testing and a final inspection, which shall be repeated by the Consultant.
 10. Workers shall wear approved respiratory and personnel protective equipment throughout all cleanup and waste disposal activities.

3.12 DISPOSAL

- A. Determine current waste handling, packaging, labeling, transportation, and disposal regulations for the work site and for each waste disposal landfill. Comply fully with

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these regulations and all U.S. Department of Transportation, EPA requirements and state and local regulations.

- B. Definition: Wastes are defined as all asbestos-containing or potentially contaminated materials or other items, which have not been completely cleaned or sealed to the satisfaction of the Consultant, while inside the work area, and must be removed from the job site. Asbestos wastes may include building materials, insulation, disposal clothing and protective equipment, plastic sheeting and tape, exhaust systems or vacuum filters, Contractor equipment, or other materials designated by state or local authorities or the Consultant or which have been potentially contaminated with asbestos and have not been fully cleaned inside the work area by vacuuming followed by thorough washing.
- C. All waste material shall be promptly placed in 6-mil polyethylene bags as it is generated. A sufficient number of waste bags shall be located in the immediate work area, and in the Equipment (dirty) room of the Worker Decontamination Facility. Count the bags and estimate the total volume leaving the work area, and maintain a written record of such (waste log).
- D. Warning labels, having waterproof print and permanent adhesive, imprinted on the sides of all waste bags or transfer containers. All waste bags must have the generator's name and address including area where waste was generated.
- E. A fine water spray shall be used to keep the waste in containers thoroughly wet at all times. When a waste bag is full, it shall be securely sealed with tape or other secure fastener.
- F. The following procedures shall be followed whenever containers or equipment are removed, from the work area:
 - 1. All combustible rubbish and debris, including properly bagged asbestos shall be properly disposed of at the end of each working day.
 - 2. The Clean Room shall be considered a holding area only during the period of active waste transfer for the purpose of the loading of carts or drums. Storage of waste in carts or a drum in the clean room is prohibited.
 - 3. Waste removal shall not occur during worker shift changes or when workers are showering or changing. Care shall be taken to prevent short-circuiting and cycling of air outward through the shower and clean room when used for waste removal.
 - 4. Workers are to be stationed in each room/area of the decontamination facility to transfer the containers and equipment to or from adjacent sections. These workers in the clean room or holding area shall enter from uncontaminated areas with appropriate personal protective equipment; or prior to the start of the waste transfer, these workers shall exit the work area, fully de-contaminated, and subsequently don't clean personal protective equipment.
 - 5. External surfaces of contaminated containers and equipment shall be cleaned by wet cleaning and HEPA-vacuuming in the work area before moving such items into the decontamination facility airlock. Workers shall not enter the airlock during this procedure.

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6. The containers of waste and the equipment shall be removed from the airlock by workers stationed in the washroom during waste removal operations.
 7. Once in the washroom, external surfaces of contaminated containers and equipment shall be cleaned a second time by wet cleaning.
 8. The cleaned containers of waste and equipment shall be placed in uncontaminated leak-tight plastic bags (or 6-mil sheeting if physical characteristics necessitate and permit). Air volume shall be minimized, and the bags or sheeting shall be sealed. Items that may puncture or tear the plastic bags or sheeting shall be placed in a hard wall container such as a drum, and then sealed.
 9. The clean re-containerized items shall be moved into the airlock for subsequent transfer to the holding area. The washroom workers shall not enter this airlock or the work area until waste removal is finished for the period.
 10. Re-containerized items and cleaned equipment shall be removed from the air lock to the holding area by workers who have entered from uncontaminated areas with appropriate personal protective equipment.
 11. The re-containerized items of waste and cleaned, bagged equipment shall be placed in open top, watertight plastic carts or drums. The carts or drums shall be HEPA-vacuumed and wet cleaned immediately following the removal of the containers of waste from them, and the location of where they are emptied shall be HEPA-vacuumed.
 12. The exit from the waste decontamination facility shall be monitored and secured at all times to prevent unauthorized entry.
 13. The carts and drums may be temporarily stored in a holding area at the work site outside the work place until a transport vehicle arrives, but such storage areas must be pre-approved by the District.
- G. Waste Container Storage: Sealed waste bags may be temporarily stored in a pre-designated and approved outside area, until a truckload quantity is obtained. The temporary storage area shall be predominantly identified and posted with signs, and waste containers shall be covered with polyethylene sheeting or otherwise protected from further contamination.
- H. Waste Removal Scheduling: All waste containers shall be decontaminated and removed from the site before final cleanup is started and isolation barriers are taken down. Pre-schedule and obtain approval of the Consultant for all time periods during which he desires to re-move waste bags from the facility. Once a truckload of waste containers has accumulated, arrange for transportation to the disposal site. Waste shall not be stored in the work area or waste decontamination facilities. Outside bag, storage must be monitored and secured at all times to prevent tampering. Storage must be in secure areas.
- I. Waste Transportation and Disposal Regulations:
1. Determine and insure compliance with: 1) the current waste handling regulations applicable to each work site; and 2) the current regulations for transporting and disposing, waste at each ultimate disposal landfill. Comply fully with these regulations and with all U.S. Department of Transportation, State, EPA, and all federal and local requirements.

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2. At no additional cost to the District, maintain a valid solid waste transportation registration issued by the California Department of Health Services Toxic Substance Division and obtain, complete, and fully comply with any other local hazardous waste manifesting requirements.
3. Transportation methods shall comply with the provisions of EPA Title 40, Part 61, Subpart M, Title 22 of the California Administrative Code, Division 4 Environmental Health, Chapter 30, Minimum Standards for Management of Hazardous and Extremely Hazardous Wastes, and with any hazardous waste regulations for temporary storage, transport, and disposal if such codes are enforced in states where the waste shall be stored, transported or disposed of.

J. Waste Container Removal and Disposal Procedure:

1. Provide waste packaging, transportation, and approved landfill disposal, plus all related recordkeeping.
2. Package, label, and remove all asbestos waste as specified. Packaging shall be accomplished in a manner that minimizes waste volume, but ensures waste containers shall not tear or break.
3. Provide legal transportation of asbestos wastes to the disposal landfill. Verify actual delivery, receipt, and disposal of each load of waste at the design landfill.

3.13 FINAL INSPECTION AND TESTING

- A. After a minimum of two (2) thorough cleanings of the work area, if a high degree of cleanliness has been achieved, notify the Consultant that the work area is ready for inspection and final testing. The Consultant and the Contractor shall visually inspect the work area for detection of any visible asbestos dust, debris or other contamination. If the visual inspection does not detect any dust, debris or other signs of contamination, final air testing shall commence.
- B. The final test shall consist of collecting air samples within the work area to establish that the airborne fiber concentrations do not exceed 0.01 f/cc, as determined by transmission electron microscopy (TEM) for Class I removal areas and phase contrast microscopy (PCM) for Class II removal areas. At the discretion of the District TEM may also be employed for one or two of the samples in Class II areas to confirm the results of the final testing via PCM. If the results of the final testing exceed 0.01 f/cc, thorough wet cleaning, and/or HEPA vacuuming shall be repeated until the required clearance levels are achieved.
- C. After achieving the levels of cleanliness and decontamination, as specified herein and as confirmed by the final inspection and air testing, the Consultant and Contractor shall thoroughly inspect the work area to determine whether any damage has been done to finishes, equipment, or any other part of the work space.
- D. Any damage to finishes, floors, walls, or other items or fixtures that have been the result of actions by the Contractor shall be repaired to original condition without any additional cost to District. A comparison to the pre-construction inspection report shall be the basis for the assessment of damages to be addressed.

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END OF SECTION 02 82 33

SECTION 02 83 33**REMOVAL AND DISPOSAL OF MATERIAL CONTAINING LEAD****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Hazardous Building Materials Survey Reports, prepared by the District's Consultant, are available from the District Construction Manager.

1.2 REFERENCE DOCUMENTS

- A. The current issue of the following documents are incorporated herein and shall govern the conduct of the Work. Where conflict among requirements or with this specification exists, the more stringent requirements shall apply.
- B. Code of Federal Regulations (CFR):
 - 1. 29 CFR 1910, Occupational Safety and Health Standards, General.
 - 2. 29 CFR 1910.134 Respiratory Protection.
 - 3. 29 CFR 1910.1025 Lead.
 - 4. 29 CFR 1910.1200, Hazard Communication.
 - 5. 29 CFR 1926 Occupational Safety and Health Standards, Construction.
 - 6. 29 CFR 1926.55, Gases, Vapors, Fumes, Dusts, and Mists.
 - 7. 29 CFR 1926.59, Hazard Communication.
 - 8. 40 CFR 61 Subpart A and Subpart M, USEPA, National Emission Standards for Hazardous Air Pollutants (NESHAP).
 - 9. 40 CFR 261, Identification and Listing of Hazardous Waste
 - 10. 40 CFR 262, Standards Applicable to Generators of Hazardous Waste
 - 11. 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste
 - 12. 40 CFR 266, Standards for the Management of Specific Hazardous Wastes.
 - 13. 40 CFR 745, Lead Renovation, Repair, and Painting Program.
- C. California Code of Regulations (CCR):
 - 1. Title 5, Sections 32240 through 32045, Lead Safe Schools Protection Act.
 - 2. Title 8, Section 1514, Personal Protective Equipment.
 - 3. Title 8, Section 1531 Construction Respiratory Protective Equipment.
 - 4. Title 8, Section 15 32 .1, Lead in the Construction Industry.
 - 5. Title 8, Section 3203, Injury and Illness Prevention Program.
 - 6. Title 8, Section 5144, Respiratory Protective Equipment.
 - 7. Title 8, Section 5155, Airborne Contaminants.

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8. Title 8, Section 5194, Hazard Communication.
9. Title 8, Section 5216 General Industry Construction Safety Orders, Lead Regulations.
10. Title 17 Sections 35001-36100 Accreditation, Certification and Work Practices for Lead Based Paint and Lead Hazards.
11. Title 22, Division 4, Minimum Standards for Management of hazardous and extremely hazardous waste.

D. Local Regulations:

1. San Diego Municipal Code, Division 10, Sections 54.1001-54.1015, Lead Hazard Prevention and Control Ordinance.

E. American National Standards Institute (ANSI):

1. ANSI Standard Z9.2 Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems.

F. American Society for Testing and Materials (ASTM):

1. ASTM Standard E1728 Standard Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination.

G. Testing Methods:

1. NIOSH Method 7082, Lead by Flame Atomic Absorption Spectrophotometry.
2. EPA Publication SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.
3. EPA Testing Method 3050B, Acid Digestion of Sediments, Sludges, and Soils.
4. EPA Method 7420, Lead (Atomic Absorption, Direct Aspiration).

1.3 SUMMARY

- A. Section includes the furnishing of all labor, materials, facilities, equipment, services, employee training, permits, agreements, waste transport and disposal necessary to perform the work required for removal of materials containing lead in accordance with these specifications, EPA, APCD, OSHA, NIOSH, State of California regulations, and any other applicable federal, state and local government regulations. Whenever there is a conflict or overlap of the above references, the most stringent provisions are applicable.
- B. The Work includes protection and decontamination of components, fixtures, contents, and equipment remaining in the work area prior to and during lead activities, including abatement and paint stabilization.
- C. Perform the work and provide service as needed to accomplish abatement of lead containing materials at the Project Site. Specific locations and materials to be

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removed/disturbed are indicated on the Drawings. Sampling data for identification of lead containing materials is available from the District Construction Manager.

- D. Comply with all requirements of this specification for work involving any amount of lead and includes lead abatement, component removal/replacement, paint stabilization, and any other control measures to reduce lead in areas with lead-based paint, presumed-lead based paint, and paint with lead content exceeding the San Diego City Ordinance threshold requiring lead-safe work practices of 0.5 mg/cm² or 1000 ppm lead. Alternate and innovative technologies and procedures are encouraged and must be submitted in detail for approval prior to any work being performed. Any alternative technologies submitted must have been written by a Certified Industrial Hygienist (CIH) or State of California Certified Lead Project Designer or Project Monitor.
- E. In the event materials containing lead in addition to those indicated in the Drawings are discovered, do not disturb. Immediately notify the District Construction Manager who will have the additional materials tested.
- F. Related Requirements:
 - 1. Section 02 82 33 "Removal and Disposal of Asbestos Containing Materials" for asbestos abatement.
 - 2. Section 02 84 33 "Removal and Disposal of Universal Waste and PCB" for Universal Waste and PCB abatement.

1.4 ALLOWANCES

- A. Allowances for removal and disposal of materials containing lead in addition to those indicated on the Drawings are specified in Section 01 21 00 "Allowances."

1.5 DEFINITIONS

- A. All terms not defined herein shall have the meaning given in the applicable publications and regulations.
- B. "Airlock" shall refer to a system for permitting ingress or egress of personnel or equipment while minimizing movement of contaminated air between a contaminated area and an uncontaminated area.
- C. "Air Monitoring" shall refer to the process of measuring the lead content of a volume of air using NIOSH method 7082 or other method approved by the District. Flow rate and sample volume shall be in accordance with the method chosen.
- D. "Authorized Visitors" shall mean the District, a visitor authorized by the District, or any representative of a regulatory agency or other agency having jurisdiction over the project.

- E. "Clearance Inspection" shall refer to an onsite limited investigation of single surface dust wipe sampling or soil performed by the Consultant at the completion of lead hazard reduction activities for deteriorated lead-based paint. Samples will be collected no sooner than 60 minutes after the completion of lead hazard reduction activities. Dust wipe samples will be analyzed in accordance with EPA Test Method SW-846 or other method approved by the District and/or Consultant.
- F. "Clean Room/Clean Area" shall mean an uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment, and that complies with the OSHA change room standard in 29 CFR 1910.141. The clean area shall contain handwashing facilities, clean clothes, clean cloths, storage for a HEPA vacuum, and respirator storage space. Contaminated equipment or personnel shall not be permitted in this area. The floors and walls of this area shall be covered with 6-mil polyethylene sheeting.
- G. "Consultant" shall mean the consulting industrial hygienist. The Consultant is an independent party retained by the District to provide consultation services for lead-related activities.
- H. "Containment Barrier" shall refer to a system, process, or barrier surrounding and sealing the outer perimeter of the work area, consisting of walls, floors, and/or ceilings. The containment barrier is designed to ensure that lead-contaminated dust, lead-contaminated soil, or lead paint contaminants are not blown, spread, or tracked from inside to outside of a work site.
- I. "Contaminated Equipment Room" shall refer to a contaminated area or room within the decontamination enclosure system that adjoins the work area, with provisions for storage of contaminated clothing or equipment.
- J. "Decontamination Area" shall refer to an enclosed area adjacent and connected to a regulated area and consisting of an equipment room, shower area, and a clean room, that is used for the decontamination of workers, materials, and equipment contaminated with lead, without permitting lead concentrations to migrate to uncontaminated areas. See OSHA regulation at 29 CFR 1926.58).
- K. "De minimus levels" shall mean an area less than:
 - 1. Two square feet in any interior room;
 - 2. Twenty square feet on an exterior surface; or
 - 3. Ten percent of the surface area on any component part.
- L. "Deteriorated paint" shall refer to paint that is cracking, flaking, chipping, peeling, or otherwise separating from the substrate.
- M. "Disposal" shall refer to all procedures necessary to transport lead-containing or contaminated waste removed from the project site and deposit it in a waste disposal site or a conversion site in compliance with applicable regulations.

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- N. "Disposal Site" shall mean a site approved by the EPA and/or applicable State and local hazardous waste control agencies for the disposal of lead-containing wastes.
- O. "District" shall mean the San Diego Unified School District.
- P. "Disturb" or "Remove paint" shall refer to any action that creates friction, pressure, heat, or a chemical reaction upon any paint on an interior or exterior surface so as to abrade, loosen, penetrate, chip, cut through, remove, or eliminate paint from that surface. This includes all lead hazard correction activities, all demolition activities, and all surface preparation activities performed upon an interior or exterior surface containing paint.
- Q. "Doorway" shall refer to a device to allow passage of personnel or equipment from one room to another while restricting air movement between the rooms so as to minimize the dispersal of lead.
- R. "Equipment Room" or "Change Room" means a contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.
- S. "HEPA Filter" shall refer to a High Efficiency Particulate Absolute filter capable of trapping and retaining 99.97% of particles with aerodynamic equivalent diameters greater than or equal to 0.3 micrometers.
- T. "HEPA Filtered or HEPA Vacuum Equipment" shall refer to equipment equipped with a HEPA filter in the exhaust outlet, and so designed and maintained that 99.97% of particles with aerodynamic equivalent diameters greater than or equal to 0.3 micrometers in the inlet air are collected and retained. All such equipment used under this contract shall be certified by manufacturers as meeting ANSI Z9.2.
- U. "HVAC system" shall refer to the heating/ventilation/air conditioning system of the building(s) within the project site.
- V. "Lead-based paint" or "lead paint" shall refer to paint or other surface coating that contains equal to or greater than 1.0 milligram per square centimeter or 0.5 percent by weight lead.
- W. "Lead-contaminated dust" shall refer to dust that contains lead equal to or greater than 10 micrograms per square foot ($\mu\text{g}/\text{ft}^2$) for interior floor surfaces, 100 $\mu\text{g}/\text{ft}^2$ for interior horizontal surfaces, and 400 $\mu\text{g}/\text{ft}^2$ for exterior floor and exterior horizontal surfaces.
- X. "Lead-contaminated soil" shall refer to bare soil containing lead equal to or greater than 400 parts per million (ppm) in children's play areas and 1000 ppm in all other areas.
- Y. "Lead hazard" shall mean:
1. The existence of deteriorated paint over a surface larger than the de minimus levels if the structure was built before 1979;

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2. The disturbance of lead-based paint or presumed lead-based paint without containment barriers;
 3. The creation or maintenance of a condition that may result in persistent and quantifiable lead exposure; or
 4. The presence of lead-contaminated dust or lead-contaminated soil.
- Z. "Limited quantity" references DOT regulations, under which 66 pounds (30 kg) or less with inner packaging up to 11 pounds (5 kg) each in strong outer packaging (49 CFR 171.8, 173.155).
- AA. "Safety Data Sheet (SDS)" shall refer to information on a product, supplied by the manufacturer, which provides the information listed by OSHA in 29 CFR 1910.1200 and 8 CCR 5194.
- BB. "mg/cm²" shall refer to milligrams per square centimeter.
- CC. "Presumed lead-based paint" shall refer to paint or surface coating affixed to a component in or on a school constructed before 1993 or other structure constructed before 1979.
- DD. "Primitive air locks" shall refer to air locks constructed using two sheets of plastic. The first one is taped on the top, the floor, and two sides of doorway. Next, a slit is cut six feet high down the middle of the plastic, not all the way to the floor. The second sheet of plastic is taped across the top of the door only, so that it acts as a flap. The flap opens into the work area.
- EE. "Project" or "Project Site" shall refer to **<insert school name>**.
- FF. "Regulated Area" shall refer to an area where lead exposure can reasonably be expected to be, or where airborne concentrations of lead exceed, or can reasonably be expected to exceed, 50 µg/m³. This includes any area in which work is being performed that disturbs or removes paint and to which access is restricted to prevent migration of contaminants.
- GG. "Removal" shall refer to procedures necessary to remove lead-based paint, lead-containing/contaminated materials, and lead waste from designated areas in a safe manner, and dispose of these materials at a disposal site.
- HH. "Transport" shall refer to hauling of lead-containing wastes from a building to the disposal site and deposit of the wastes therein by a firm currently approved by the EPA for the transport of hazardous wastes and approved by any state or local agencies having jurisdiction.
- II. "µg/m³" shall refer to micrograms per cubic meter.
- JJ. "µg/ft²" shall refer to micrograms per square foot.

- KK. "Wash room" shall refer to a room contiguous to a clean room and an equipment room in the decontamination area, equipped with one or more wash basins to adequately accommodate the workers. Provide an adequate supply of soap, shampoo, and towels.
- LL. "Wet cleaning" shall refer to the process of eliminating lead contamination from building surfaces and objects by methods that render lead adequately wet. Such methods include use of cloths and mops, or low-flow amended water sprays, or other cleaning tools that have been dampened with clean and/or amended water.
- MM. "Work Area" shall refer to an area where lead-based paint or presumed lead-based paint is disturbed or abatement is conducted.

1.6 PRE-REMOVAL MEETINGS

- A. Pre-Removal Conference: Conduct conference at Project Site.
1. The District will arrange a Pre-Removal Conference, attended by a representative of the District, the Consultant, and the Contractor.
 2. The Contractor shall identify his Supervisor and Foreman at this conference.
 3. Provide electronic copies of "Action Submittals" at least five working days prior to this conference.
 4. Pre-Removal Conference topics may include:
 - a. Contractor listing of existing site condition (e.g. damage).
 - b. Review and confirm scope of work, Hazardous Building Material Survey Reports, and material quantities.
 - c. Contractor and supporting vendor site access and parking.
 - d. Coordination of Contractor access routes to the work area, including approved doors, stairways, corridors, and elevators.
 - e. Availability of building utility services, such as power, water, and drains.
 - f. Determination of equipment and other movable items to be removed from the work area(s) by the Contractor, and the location of temporary storage space.
 - g. Location, coverage, and use of isolation barriers and decontamination facilities.
 - h. Emergency Response Procedures.

1.7 ACTION SUBMITTALS

- A. Lead Compliance Plan. The Plan shall meet the requirements of 8 CCR 1532.1 e(2)(B) and include minimally the following:
1. A description of each activity during which lead is emitted including equipment used, material involved, controls in place, crew size, employee job responsibilities, operating procedures and maintenance practices.

2. A description of the specific means that will be employed to achieve compliance and, where engineering controls are required, engineering plans and studies used to determine methods selected for controlling exposure to lead.
3. A report of the technology considered in meeting the PEL.
4. Air monitoring data that documents the source of lead emissions.
5. A detailed schedule for implementation of the program, including documentation such as copies of purchase orders for equipment, construction contracts, etc.
6. A work practice program that includes compliance items related to protective work clothing and equipment, housekeeping, hygiene facilities, hygiene practices, and regulated areas and other relevant work practices.
7. An administrative control schedule, if applicable.
8. A description of arrangements made among contractors on multi-contractor sites with respect to informing affected employees of potential exposure to lead and of regulated areas.
9. Any other relevant information.

1.8 INFORMATIONAL SUBMITTALS

A. Pre-Removal Submittals:

1. Copies of all notifications, permits, applications, licenses and like documents required by federal, state, or local regulation in proper fashion, including CDPH form 8551, Cal-OSHA Notification, and notice to occupants if applicable. Notification shall be given to the District and Consultant at least 5 working days prior to the beginning of each phase or mobilization of work involving lead.
2. Copies of each worker's medical clearance to wear respirators.
3. Statement by the examining medical doctor that medical exams required by California-OSHA for lead work took place, and when, for each employee to be used on the project.
4. Record of successful respirator fit testing performed by a qualified individual within the previous twelve months, for each employee to be used on this project with the employee's name and fit test date, fit test method, and model and size of respirator with each record. NOTE: In the event employees are hired after the project start date, supply the proper documentation as required at least 24 hours in advance of their start.
5. Name of designated competent person(s), certificate(s) of training, and copies of "Lead-Related Construction Supervisor" certifications granted by the California Department of Public Health.
6. List of all supervisors and workers intended to be assigned to the project and copies of CDPH Lead-Related Construction Certifications granted by the California Department of Public Health.
7. Proposed Emergency Plan and route of egress from work areas in case of fire or injury, including the name and phone number of nearest medical assistance center. This shall be conspicuously posted at the work site and filed with proper agencies.
8. The name and address of Contractor's personal air monitoring and waste disposal lead testing laboratory(ies) including certification(s) of ELPAT accreditation for heavy metal analysis and National Lead Laboratory

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Accreditation Program (NLLAP) and American Industrial Hygiene Association (AIHA) accredited for lead analysis for air monitoring laboratory.

9. Safety Data Sheets (SDS) on all materials and chemicals to be used on the project.
10. Name, address, and ID number of the hazardous waste hauler, waste transfer route, and proposed disposal site.
11. Name, address, and ID number of the proposed construction debris disposal site.
12. Name, address, and ID number of hazardous waste disposal site. Documentation must be submitted from these sites proving they are licensed to accept such waste and will accept such waste.
13. A copy of the Contractor's CAL-OSHA Lead Compliance Plan, in accordance with Title 8, Section 1532.1.
14. A copy of the Contractor's CAL-OSHA Respiratory Protection Program, in accordance with Title 8, Section 5144.
15. A copy of the Contractor's CAL-OSHA Injury and Illness Prevention Program, in accordance with Title 8, Section 3203.

B. Submittals During Removal Work:

1. Remediation Progress Report.
2. Results from personal air samples.
3. Results from waste testing.
4. Results from other testing.
5. Medical, Fit Test and CDPH Lead-Related Construction Certification twenty-four (24) hours in advance of any new employees starting on the project.

C. Submittals After Removal Work:

1. Original manifests and receipts acknowledging disposal of all hazardous and non-hazardous waste material from the project showing delivery date, quantity, and appropriate signature of landfill's authorized representative.
 - a. Submit within 30 days of date that material was transported off site.

1.9 CLOSEOUT SUBMITTALS

A. Submit immediately upon completion of lead-related work:

1. All personal monitoring results.
2. All waste characterization test results.

1.10 PERFORMANCE REQUIREMENTS

A. Applicable Standards:

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1. Per California Department of Public Health, all paint on schools applied prior to January 1, 1993 is "presumed lead-based paint", and requires compliance with the most current laws and regulations including SB460 effective January 1, 2003.
2. Per CAL-OSHA and Federal OSHA, whenever construction activities disturb lead in any amount, the employer must assume that employees may be exposed to lead and comply with the requirements of the "Lead in Construction Standard" Title 8, Section 1532.1.
3. Per the City of San Diego Ordinance 19732, any person who disturbs or removes paint in the interior or exterior of a dwelling unit or structure constructed prior to January 1, 1979, or from any surface on a steel structure, shall use lead-safe work practices, unless a certified Inspector/Assessor determines, prior to the commencement of activities which disturb or remove paint, that the concentration of lead in paint is below 1,000 parts per million or 0.5 milligrams per square centimeter.

B. Contractor Personnel Qualifications:

1. All workers assigned to this project shall have been trained in accordance with California Construction Safety Orders, 1532.1, Lead-Related Construction, and shall hold "Lead-Related Construction Worker" certifications granted by the California Department of Public Health.
2. Provide one full-time onsite Supervisor whose duties shall include coordination, safety, security, and execution of all phases of the Work. The Supervisor shall not be used as a worker. The Supervisor shall hold "Lead-Related Construction Supervisor" certifications granted by California Department of Public Health.

C. Contractor Responsibilities:

1. Notifications /Approvals: In proper and timely fashion, make all applicable and necessary notifications to relevant federal, state, and local authorities and obtain and comply with the provisions of all permits or applications required by the work specified, as well as make all required submittals required under those auspices. The costs for all permits, applications, fees the like, are to be borne by the Contractor.
2. Notice to Occupants: Provide a "Notice to Occupants", meeting the requirements of the City of San Diego Lead Ordinance Section 54.1006, at least seven business days prior to any activities that disturb or remove presumed-lead based paint, lead-based paint, or paint containing greater than 1000 ppm or 0.5 mg/cm² lead. Provide notice to the District and Consultant and post at the work area.

D. Work and Scheduling Requirements:

1. Work shall be carried out in sequential phases. Inspection and approval of each phase by the Consultant shall be sought and gained before proceeding to the next phase. Work shall proceed in accordance with the schedule agreed upon by the District and approval of each phase by the Consultant shall be sought and gained prior to proceeding to the next phase. As a Contract requirement, any reasonable delay caused by this requirement shall not constitute a basis for claim against the District or Consultant.

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2. Project Sequence:

- a. Extend full cooperation to District in all matters involving the use of District's facilities. At no time shall Contractor cause or allow to be caused conditions that may cause risk or hazard to the public or conditions that might impair safe use of the facility. The use of the facility's electricity, water or like utilities by the Contractor shall be in accordance with Section 01 50 00 "Temporary Facilities and Controls."
- b. Coordinate the work of this Section with that of all other trades. Work shall not proceed in any area without the express consent of the District and Consultant. Be available within 24 hour's notice for additional work or rework if after acceptance of the work it is found that full remediation was not achieved from the initial work effort as determined by the District and Consultant.

E. Protection of Persons and Property:

1. General:

- a. Provide medical surveillance and biological monitoring on all workers in accordance with 8 CFR 1532.1.

2. Respiratory Protection:

- a. Provide workers and supervisory personnel with NIOSH approved respirators and P-100 (HEPA) filters. Respiratory protection shall be implemented for all work performed under this Section. The respirators shall be sanitized and maintained according to the manufacturer's specifications. Disposable respirators are not acceptable under any circumstances.
- b. Maintain on-site a sufficient supply of P-100 filters to allow workers and supervisory personnel to change contaminated filters per manufacturer's recommendations or when breathing resistance increases. Comply with all applicable regulations.
- c. Respirators shall be individually assigned to removal workers for their exclusive use. All respiratory protection shall be provided to workers in accordance with the respiratory protection program, which must include all items specified by CAL-OSHA Respiratory Protection Program Title 8, Section 5144, including medical clearance, fit-testing, training, cleaning, storage, inspection, and maintenance. A copy of this program shall be kept at the worksite, and shall be posted in the clean area.
- d. Additional respiratory protection using adsorbent media, such as organic vapor cartridges, may be needed when handling some coating products. If this is the case combination cartridges that are equipped with P-100 filters in series with the appropriate adsorbent media are required. Consult the Safety Data Sheets (SDS) and obtain the proper cartridges as necessary.
- e. Facial hair such as beards, long sideburns, and moustaches that interfere with the seal of air purifying type respirators are prohibited. Workers with eye corrective lenses (contact lenses or glasses) shall wear the corrective

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lenses in a manner that is in compliance with 8 CCR 1529 and 8 CCR 5144.

3. Personal Protective Equipment:

- a. Provide personal protection, in the form of disposable coveralls to all workers, supervisors, and authorized visitors entering the work area during activities disturbing lead.
- b. Provide each worker with disposable suits every day. Under no circumstances shall anyone entering the removal area be allowed to reuse a contaminated uniform. In addition to disposable suits for the workers, supply suits for the Consultant and other personnel who are authorized to inspect the worksite. Disposable suits, such as TYVEK suits, and other personal protective equipment (PPE) must be donned prior to entering work area. A clean area shall be provided for workers to put on suits and other personal protective equipment and to store their street clothes.
- c. Work clothes shall consist of disposable full-body suits, head covers, gloves with cuffs extending outside the sleeves of the protective suit, boot or shoe covers, and other protection as needed. Hard hats shall be worn, as required.
- d. Provide eye protection to personnel engaged in lead operations when the use of a full-face respirator is not required.
- e. Goggles with side shields shall be worn when working with a material that may splash or fragment, or if protective eyewear is specified on the Safety Data Sheet (SDS) for that product.
- f. All disposal protective clothing shall be discarded and disposed of as lead-contaminated waste every time the wearer exits from the workspace to the outside. All exits from the workspace will be through the decontamination facilities, except in the event of an emergency.

4. Air Monitoring:

- a. General: Perform personal air sampling during activities involving lead. The results of such sampling shall be posted, provided to individual workers, and submitted to District and/or Consultant as described herein.
- b. Sampling: Take samples for the duration of the work shift or for eight hours, whichever is less. Personal air samples need not be taken every day after the first day if working conditions remain unchanged, but must be taken every time there is a change in the removal operation, in terms of either the site or the type of work. Sampling will be used to determine eight-hour time-weighted average (TWA) exposure.
- c. Sampling Results: Transmit air sampling results to the District and/or Consultant and individual workers in written form no more than forty-eight (48) hours after the completion of a sampling cycle. The reporting document shall list each sample's sampling time and date, personnel monitored, flow rate, sample duration, analytical laboratory, analytical results, and shall include an interpretation of the results. Air sample analysis results shall be reported in micrograms/cubic meter ($\mu\text{g}/\text{m}^3$).

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- d. Testing Laboratory: The Contractor's testing lab shall be National Lead Laboratory Accreditation Program (NLLAP) and American Industrial Hygiene Association (AIHA) accredited for lead analysis.
 - e. Air Monitoring Frequency: The air monitoring frequency for Contractor operations shall be in accordance with the requirements set forth in Title 8, Section 15 32 .1.
5. Damage and Repairs to Project Site: Work activities involving lead shall be performed without damage to the building(s), including structural members, ceilings, pipes, walls, or light fixtures. Provide protection of these items and materials as part of work area preparation. Where work activities involving lead causes damage, patch, repair, replace or otherwise restore the damaged items to their original condition or replace with better materials, with no additional cost to the District. This includes repair of surfaces damaged during component removal as described herein.

1.11 QUALITY ASSURANCE

- A. District's Role: The performance and execution of the project will be monitored by the District. The District will bear costs associated with the independent laboratory and inspection work required in these Specifications for clearance testing, third party oversight, and oversight sample analyses, unless otherwise noted.
 - B. Consultant's Role: The District shall retain the services of a CDPH-certified Lead Project Monitor for the purposes of management of the work activities involving lead described herein. The Consultant will represent the District in all phases of the work activities involving lead, at the discretion of the District. Regard the Consultant's direction as authoritative and binding, as provided herein, in matters particularly involving, but not limited to, approval of work areas, review of monitoring results, completion of various segments of work, final completion of work activities involving lead, submission of data, and daily field punch list items.
1. Inspections: In addition to various daily inspections of the lead work area and work practices, the Consultant will make three mandatory inspections during the work, one during each phase of removal. Each inspection must be requested by the Contractor and be performed by the Consultant. The work being inspected must meet the Consultant's satisfaction before work may begin for the next phase of work. Failure on the part of the Contractor to obtain the Consultant's approval before proceeding to the next scheduled phase is regarded as a violation of this Section. In the event of this occurring, the Consultant will request work to be stopped and the District will be contacted to intervene. The three inspections are as follows:
- a. Work Area Preparation Completed: Have all pre-removal preparations of the work area complete, seek, and review approval from the Consultant to proceed.
 - b. Post Removal Inspection: Work shall have been completed including renovation, removal, paint stabilization, or abatement. Final clean-up of all

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visible debris final cleaning techniques of wet washing and HEPA vacuuming will have been completed.

- c. Final Clearance: The Consultant will perform final clearance wipe testing as soon as possible after final clean-up activities are completed, or as appropriate.

PART 2 - PRODUCTS

2.1 GENERAL

- A. No materials, equipment, or tools belonging to the District shall be used by the Contractor, except in case of an emergency and upon explicit authorization by the District.
- B. Deliver all materials and equipment to the site in the original containers bearing the name of the manufacturer and details for proper storage and usage.
- C. All materials or equipment delivered to the site shall be unloaded, temporarily stored, and transferred to the work area in a manner, which shall not interfere with operations of the District.
- D. The District and/or Consultant must approve unloading and temporary storage sites and transfer routes in advance.
- E. Damaged or deteriorated materials may not be used and must be promptly removed from the project site. Materials, that have become contaminated with lead shall be packaged as lead waste, characterized, and disposed of in an approved landfill.
- F. All materials, tools, and equipment must comply at a minimum with this specification and all applicable federal, state, and local regulations.

2.2 MATERIALS

- A. Plastic Sheeting: Sheet shall be fire-retardant polyethylene sized in lengths and widths to minimize the frequency of joints. The minimum thickness shall be 6-mils.
- B. Barrier Tape: Tape labeled as "CAUTION-LEAD HAZARD-DO NOT ENTER WORK AREA UNLESS AUTHORIZED" or similarly labeled, for use on the exteriors of the buildings.
- C. Tape: Tape shall be capable of sealing joints of adjacent sheets of plastic and of attaching plastic sheet to finished or unfinished surfaces of dissimilar materials, and shall be capable of adhering under dry and wet conditions, including wetting by amended water.

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- D. Lead Disposal Packaging: Packaging shall be suitable to receive and retain any lead-containing materials until disposal or conversion at an approved site. The packaging shall be both air and watertight.
 - 1. Bags: Disposal bags shall be double 6-mil thick polyethylene, pre-printed with labels as required by 8 CCR Section 15 32 .1.
 - 2. Labeling: Stick-on labels as per EPA, OSHA, and DOT requirement for disposal drums.
- E. Warning Signs: Signs shall be as posted to each entrance to and from the work area undergoing lead hazard reduction in accordance with Title 17 CCR 35001-36100 and 8 CCR 1532.1.
- F. Flexible duct: For ventilation units (if required).
- G. Spray adhesive: Must be fire-retardant.

2.3 TOOLS AND EQUIPMENT

- A. Airless Sprayer: Amended water and surface sealers shall be applied with an airless or other low-pressure sprayer or injector suitable for the specific application.
- B. Air Purifying Equipment: Equipment used to establish negative pressure in the work area shall be HEPA-filtered. If negative air machines will be exhausted inside any part of the building, they must be DOP tested and certified on site or have a certification of passing DOP testing attached.
- C. Vacuum Equipment: All vacuum equipment used for cleaning up shall be HEPA-filtered. Each HEPA-filtered vacuum brought onsite must be DOP tested and certified. DOP testing can be conducted on or off site, providing that each unit has a certification (of passing DOP testing) attached. At least one HEPA vacuum shall be equipped with floor (hard surface and carpet) cleaning attachments.
- D. Scaffolding/Staging/Ladders: Shall meet OSHA safety regulations, including 29 CFR 1926.450-452 and 8 CCR 1637. Where electrical power and water are used inside a work area, no electrically conductive ladders (e.g., aluminum or steel) shall be used (except for hinges and feet).
- E. Transportation Equipment: Shall be suitable for loading, temporary storage, transport, and unloading of lead-contaminated materials without exposure to persons or property. Equipment shall be currently registered with the State for transport of hazardous wastes and be currently certified by the State for vehicle inspection.
- F. Other Tools and Equipment: Furnish all equipment such as lumber, nails, ladders, hardware, and supplies that may be required to construct and dismantle the decontamination areas and the barriers that isolate the work area. Provide other suitable tools for the lead-related activities, including hand scrapers, wire brushes, sponges, mops, and shovels.

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- G. Electrical: Electrical tools and equipment shall meet all applicable codes and regulations, including, in particular, 29 CFR 1910.304, 29 CFR 1926.400-449, and 8 CCR 1760.
 - 1. Grounding. Ground fault circuit-interrupters shall always be used for all electrical equipment, except to the extent provided in an assured equipment grounding conductor program, 29 CFR 1926.404, and 8 CFR 2405.4.
 - 2. Additional requirements. Other OSHA requirements for equipment grounding conductors, beyond those described in the grounding paragraph, apply.
- H. Fire extinguishers.
- I. Portable eye washes.

PART 3 - EXECUTION

3.1 WORK AREA PREPARATION

- A. Signage: Prior to the preparation of a building for work activities involving lead, place warning signs immediately outside all entrances and exits to the building, warning that lead-related work is being conducted in the vicinity. The signs shall be in English and Spanish, at least 20 inches by 14 inches with bold lettering, and not smaller than 2 inches tall, and read: "WARNING: LEAD PAINT REMOVAL HAZARD; UNAUTHORIZED ENTRY PROHIBITED; NO SMOKING, EATING OR DRINKING ALLOWED IN THE WORK AREA.
- B. Access to the Work:
 - 1. The District will provide specific access as required during the project to the Contractor's personnel assigned to the project. Allow only authorized personnel into the work area.
 - 2. Maintain a bound logbook in which any person entering or leaving the lead work area must sign and enter the dates and times of entry and departure.
 - 3. Use of waste containers onsite shall be controlled under the following requirements:
 - a. Location of waste containers onsite shall be coordinated with the District and Consultant.
 - b. The waste containers shall be solid enclosed containers, lined with two layers of 6-mil polyethylene sheeting locked and secured at all times, when not in immediate use.
 - c. Comply with all federal, state, and local regulations and ordinances regarding lead waste storage.
 - d. Do not allow anyone access to the building unless they have successfully completed a training program and are wearing a properly fitted respirator, unless stated otherwise by the Consultant.

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- C. Containment: Establish "containment" as specified in tables 8.1, 8.2, and 8.3 of the HUD guidelines and Appendix A of the City of San Diego Lead Ordinance, as applicable. Copies of these tables are included in Appendix A of this Section.
1. Decontamination Unit: At a minimum construct a two-stage decontamination unit. This unit shall be connected to the work area (abatement or paint stabilization) for the decontamination of workers contaminated with lead. The decontamination unit shall consist of an equipment room, dirty room, and wash area in series. Ensure that employees enter and exit the work area through this unit. In addition, the decontamination unit shall be constructed with 6-mil polyethylene sheeting on floors, walls, and ceiling. Doors through this unit shall be constructed as described in Appendix A of this Section.
 2. Clean Area: Select a clean area outside the lead work area for the workers to change into protective equipment. This area shall contain hand washing facilities, clean cloths, storage for a HEPA vacuum, and respirator storage space. Contaminated equipment or personnel shall not be permitted in this area. The floors and walls of this area shall be covered with 6-mil polyethylene sheeting.
 3. Lead Work Area: Pre-clean all surfaces with a HEPA vacuum and remove any furniture, or other movable objects. All debris gathered during this clean up shall be disposed of properly. Requirements are the same for abatement or paint stabilization area(s).
 4. Deteriorated Lead-Based Paint: Clean any surfaces impacted by deteriorated lead-based paint. The cleaning of these surfaces shall be completed during establishing "containment" for the work area.
- D. Approvals and Inspections. All temporary facilities, work procedures, equipment, materials, services, and agreements must strictly adhere to and meet this Section along with EPA, OSHA, NIOSH, HUD regulations, recommendations, and guidelines, as well as any other federal, state, and local regulations. Where there exists an overlap of these regulations and guidelines, the most stringent one applies. All work performed by the Contractor is further subject to approval of the District and/or Consultant.

3.2 WORK AREA PROCEDURES

- A. In order to avoid possible exposure to dangerous levels of lead and to prevent possible contamination of areas outside the demarcated work area, work shall follow the general guidelines listed below.
1. Work Area Entry: At no time shall a worker or other authorized personnel entering the work area go further than the Clean Area without proper respiratory protection and protective clothing. Work area entry is through the decontamination area.
 2. Work Area Departure: The worker shall remove all gross contamination, debris, and dust from the disposable suit by completely HEPA vacuuming them before leaving work area. Work area exit is through the decontamination area.
 3. Personal Protective Equipment: All persons leaving the work area must remove their PPE (except respirators) before leaving. Suits shall be removed "inside out" to minimize the dispersal of lead dust.

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4. Equipment: All equipment used by the workers inside the work area shall be either left in the work area or thoroughly decontaminated before being removed from the area. Extra work clothing (in addition to the disposable suits supplied by the Contractor) shall be left in the clean area until the completion of work in that area. The clean area shall be cleaned of all visible debris and disposable materials daily.
 5. Footwear: As with additional clothing, all footwear shall be left inside the clean area until the completion of the job and then shall be HEPA vacuumed or discarded as contaminated waste.
 6. Shock hazards.
 - a. Use safe procedures to avoid electrical hazards. Power shall be shut off and checked before work begins when a hazard exists.
 - b. All extension cords and power tools used within the work area shall utilize in-line Ground Fault Circuit Interrupters (GFCI).
- B. Prohibited Practices. Under no circumstances shall workers or supervisory personnel eat, drink, smoke, chew gum, chew tobacco, or remove their respirators in the work area. To do so shall be grounds for the District and/or Consultant to stop all operations. Only in the case of life threatening emergency shall workers or supervisory personnel be allowed to remove their protective respirators while in the work area. In this situation, respirators are to be removed for as short of duration possible.

3.3 WORK ACTIVITIES INVOLVING LEAD

A. General:

1. Workmanship: All lead-related work activities shall be conducted in a professional workman-like manner. Since any lead-related work procedure may cause damage to the substrate and/or adjacent surface if performed improperly, strict work controls are required.
2. Approval: Receive prior approval from the District and Consultant before using any materials or equipment. No methods involving open flame, wire brushing, or dry scraping alone, or with the aid of flammable solvent or abrasive compound, or solvents containing methylene chloride, shall be used in removing paint.
3. Disposal: All leaded materials, residues, debris, or soil contaminated as a result of lead-related work, must be treated, and/or disposed of in accordance with regulations and guidelines of EPA, HUD, state and local regulations and ordinances, and all other applicable agencies.
 - a. All such materials shall be wrapped in 6-mil plastic sheeting with all edges and seams sealed or placed in 6-mil plastic bags with the top of the bags twisted so as to form a loop. The loop shall then be sealed. The bags of residue/debris shall then be further containerized in an additional 6-mil plastic bag.
 - b. The sealing process shall include the use of a waterproof tape of sufficient strength so as to maintain the integrity of the seal.

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- c. All components shall have all nails and/or other hardware flattened or removed prior to disposal.
 - d. The residue/debris shall be lightly misted prior to placement for disposal.
 - e. The residue/debris shall be carefully handled so as to prevent rupture, or in any way diminishing container integrity.
 - f. All wastewater shall be collected and tested prior to disposal. Consider filtering the water through a 5-micron filter prior to testing.
4. Damage and Repairs to Project Site: Work activities involving lead shall be performed without damage to the building(s), including structural members, ceilings, pipes, walls, or light fixtures. Provide protection of these items and materials as part of work area preparation. Where work activities involving lead causes damage, patch, repair, replace or otherwise restore the damaged items to their original condition or replace with better materials, with no additional cost to the District. This includes repair of surfaces damaged during component removal as described herein.
 5. Responsibilities and Supervision: Use approved lead-related work practices during the course of the work. Abide by all of the worker protection and safety specifications as outlined. Provide electrical service sufficient for the equipment to be used during lead-related work. Provide plumbing so that adequate services are available for washing down the areas after lead-related work and for personal hygiene. Provide an on-site lead abatement Supervisor/Competent Person during all phases of work activities involving lead.
- B. Component Removal Procedures: All bundles of "containers" of removed components and/or debris shall be carefully handled to reduce the potential of ripping, bursting, or otherwise diminishing the integrity of the bundle or "container".
1. Care shall be taken so that leaded materials are neither burned, made to become dusty, nor result in further exposure to workers, occupants, children or observers.
 2. Care shall be taken to avoid damage to adjacent areas during the removal of components to be replaced. Run a utility knife around the edge (score) of the component substrate and the adjacent (non-abated) substrate to cut any bonding between the substrates and thereby eliminate damage.
 3. If components to be removed contain gross areas of loose or peeling paint, these areas shall be wet scraped or HEPA vacuum prior to removal. The paint chips shall be contained either in the HEPA vacuum or in a separate 6-mil polyethylene bag. Temporary encapsulant expressly for this purpose is also acceptable.
 4. Components that are removed for replacement shall be wrapped and stored for disposal, or disposed of in accordance with the applicable codes and requirements of this Section.
 5. Wood Component Removal: A pry device shall be utilized to carefully remove the components. Once the component has been removed, the resulting material shall be cut into lengths that are easily managed for the purposes of containerization. Containerization shall be accomplished by removing or flattening all nails to prevent punctures or tearing and wrapping the material in six-mil plastic sheeting. The wrapping shall be finalized by securing with waterproof tape of sufficient strength at all edges and seams, so as to prevent diminishing the integrity of the container.

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C. Paint Film Stabilization.

1. Substrate Repairs:
 - a. Prior to stabilizing lead-based paint, correct substrate surfaces defects. Remove loose, unsound, or deteriorated substrates.
 - b. Place in 6-mil polyethylene disposal bag and dispose of in accordance with applicable regulations.
2. Paint Removal.
 - a. Wet Scraping: Remove all loose, flaking, and deteriorated paint by wet scraping. Continually mist surface with water during scraping. Clean any generated debris by HEPA-vacuum.
 - b. Wet Sanding: Prepare finish surfaces by wet sanding, feathered edges lightly. Keep surface wet while sanding. Use hand sanding and HEPA-vacuum debris. If mechanical sanders are used they must be equipped with integrated HEPA-filtered dust collection.
3. Surface Cleaning.
 - a. Dust and chips: HEPA vacuum surface after drying.
 - b. Chemically treat surface if necessary for good paint adhesion. Follow manufacturer's printed instructions for system used.
 - c. Test surface for pH following chemical treatment.

D. Demolition of Materials Containing Lead:

1. Exclusion Zone: At a minimum, an exclusion zone of 20 feet shall be established around the work area prior to commencement of demolition activities.
2. Worker Safety: During demolition activities, only workers certified under the CDPH LRC program shall be allowed within the exclusion zone, including machinery operators and supporting workers. Workers shall also don Level C PPE, as outlined by OSHA and specifically consisting of respirators equipped with P-100 HEPA filter cartridges, coveralls, hardhats, work gloves, and appropriate footwear.
3. Public Safety and Perimeter Monitoring: To ensure public safety, the Contractor's Supervisor/Competent Person shall not be within the exclusion zone and shall instead be responsible for maintaining the integrity of the exclusion zone (i.e., keeping members of the public and any other trades onsite out of the exclusion zone). The Consultant shall perform perimeter monitoring of demolition activities at a frequency adequate to establish work is being performed in an appropriate and safe manner.
4. Demolition Activities: Demolition shall be completed using adequate amounts of water (i.e., "wet methods") to control the release of lead dust.

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5. Waste Storage and Characterization: Following demolition, waste shall be stockpiled, either on hardscape (i.e., concrete or asphalt) or on a poly drop sheet, and covered while characterization of the waste stream occurs. The Contractor shall be responsible for sampling and characterization of waste generated during demolition activities.
6. Disposal: Disposal shall meet standards specified above.

3.4 CLEANING AND FINAL CLEARANCE

- A. End of Day Cleaning: Thirty (30) minutes prior to the end of each workday, the lead work area must be cleaned of all debris. Under no circumstances will lead clean-up be permitted when active LBP removal work, lead paint stabilization, or other work involving disturbance of lead paint, presumed-lead based paint, or paint exceeding the City of San Diego threshold requiring lead-safe work practices is proceeding. All interior surfaces in the work area shall be cleaned of dust and debris. Such cleaning shall include a thorough HEPA vacuuming of all affected surfaces, as determined by the Consultant. Additionally, such cleanings may require the use of a lead-specific cleaner. All waste materials generated during this daily clean up shall be disposed of as hazardous waste, unless analytical testing proves otherwise.
- B. Equipment Cleaning: Durable equipment, such as power and hand tools, generators, and vehicles shall be cleaned prior to removal from unit undergoing lead paint removal or paint stabilization on the site. All equipment shall be cleaned by HEPA vacuuming and wet washing with a lead-specific cleaner.
- C. High Efficiency Particulate Air (HEPA) Vacuum: Obtain HEPA vacuum attachments, such as various size brushes, crevice tools, and angular tools to be used for varied applications and service the HEPA vacuum routinely to assure proper operation. Caution shall be used any time the HEPA vacuum is opened for filter replacement or debris removal. Operators shall wear a full set of protective clothing and equipment, including respirators, when using the HEPA vacuuming equipment or removing/replacing used filters.
- D. Preliminary Cleanup: Upon completion of the abatement, stabilization, or interim control and a satisfactory visual inspection by the District and/or Consultant in a given work area, perform a preliminary clean-up. This clean-up includes removal of any contaminated material, equipment, or debris including polyethylene sheeting from the work area. The polyethylene sheeting shall first be sprayed or misted with water for dust control, the resulting debris removed, and then the sheeting shall be folded in upon itself.
 1. Large Debris: Large debris from work activities involving lead shall be wrapped in polyethylene sheeting at least 6-mil thick, sealed with heavy-duty duct tape, and stored until proper disposal.
 2. Small Debris: Prior to picking up or collecting small debris, the surfaces of this debris will be sprayed with a fine mist of water. The debris will be picked up, collected, and placed into a single plastic bag, at least 6-mil thick. The bags shall

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- not be overloaded, shall be securely sealed, and shall be stored in the designated area until disposal. Dry sweeping is not permitted in the work area; wet sweeping is required.
3. Plastic Sheetting: Removal of surfaces 6-mil polyethylene sheeting shall begin from upper levels. Removal of ground polyethylene sheeting shall begin at the corners and folded into the middle to contain the dust or residue. All collected polyethylene sheeting shall be placed in 6-mil polyethylene bags for proper disposal as described in these Specifications.
 4. HEPA Vacuum: Once the 6-mil polyethylene sheeting is removed from the work area, cleaning shall begin with a thorough HEPA vacuuming of all surfaces, starting at the ceilings, proceeding down the walls and including window, door, and door trim and floor. The floor shall be vacuumed last, beginning at the farthest corners from the entrance to the work area. HEPA vacuuming shall again be performed as noted above, after the following wet wash.
 5. Wet Wash: Next, wet wash or mop the same surfaces with a lead-specific cleaner and allow surfaces to dry. Then a second HEPA vacuuming of the surfaces will be performed by the contractor, as described above. By the conclusion of the cleaning phase, all visible dust and debris shall have been completely removed.
 6. Hygiene, Cleaning Equipment and Supplies. Special attention shall be given to personal hygiene and the cleaning of supplies and equipment. All mop heads; sponges and rags shall be replaced or changed daily, at a minimum. Rags, mop heads or sponges may be reused if the Contractor has them cleaned via a washing system specially equipped with HEPA filtration.
 7. Detergents: Prepare and use detergents specifically designed for lead abatement work. The manufacturer's recommended coverage will be followed. Detergent solutions should be replaced as needed.
 8. Wastewater. The wastewater from the clean-up shall be contained and disposed of according to all applicable federal, state, county, and local regulations and guidelines. In no instance shall wastewater be disposed in storm sewers (e.g., yard inlet or street drain) or sanitary sewers (e.g., toilet, sink, or any other household/ residential/ commercial type drain system) without specific governmental approval.
- E. Visual Inspection: Request a visual inspection by the Consultant. If the area does not pass a visual inspection, re-clean the area.
- F. Work Area Clearance: When all surfaces have passed visual inspection, wipe samples shall be performed by the Consultant. This shall be performed after completion of the final clean up. The standards for passing a wipe test are outlined herein. Should laboratory results indicate that the wipe test clearance level is exceeded, re-clean the affected area, at no additional cost to the District, utilizing the methods specified above. Re-testing will then be performed to verify compliance with the mandated levels. Pay for all additional testing and provide, at no additional cost, a re-cleaning of an affected area until the clearance level is achieved. Bear any additional expenses, such as relocation expenses and Consultant fees, due to failure of clearance testing.

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- G. **Finish Coatings.** Finished coatings, including stains, primer, sealers, and poly coatings, if used, shall only be applied upon approval by the District and/or Consultant. Any surface requiring painting shall be primed with an approved primer.
- H. **Final Clearance.** Final clearance shall take place after finish coating has been applied. Final clearance shall include visual inspection and wipe sampling as per Section 3.4 (I) and (J).
- I. **Inspection/Clearance Standards.** When clean-up has been completed and all surfaces have been sealed, wipe samples by the Consultant will be performed. The following standards shall be met for all "clearance" requirements.

Type of Procedure	Number and Location of Wipe Samples
Interior Treatments	<p>Two wipe samples from every treated room (up to four rooms) as follows:</p> <ul style="list-style-type: none"> One interior window sill or window trough, alternating between rooms (one floor if window not present) One floor
Exterior Treatments	<p>Two wipe samples as follows:</p> <ul style="list-style-type: none"> At least one dust sample on a horizontal surface in part of the outdoor living area One window trough sample on each floor where exterior work was performed
<p>Notes:</p> <p>(1) An area is a room, closet, pantry, hall, portion of room (such as the dining area of a kitchen/dining room), etc. If a room and its closet are both abated, they can be treated as one area for purpose of wipe testing.</p> <p>(2) Other applicable areas may also have wipe samples taken, at the discretion of the Consultant in conformance with the HUD Guidelines for the Evaluation and Control of LBP Hazards in Housing.</p>	

- J. **Wipe Standards.** The standards for passing a wipe test are:
- Floors. 10 micrograms per square foot or less.
 - Interior window sills/surfaces. 100 micrograms per square foot or less.
 - Exterior horizontal window and floors. 400 micrograms per square foot or less.
- K. **Retests:** Should laboratory results indicate that the wipe test clearance level is exceeded, re-clean the affected area, at no additional cost to the District, utilizing the methods specified above. Retesting will then be performed to verify compliance with the mandated levels. Pay for all additional testing and Consultant fees, and provide at no additional cost a re-cleaning of an affected area until the clearance level is achieved.

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3.5 DISPOSAL OF WASTE MATERIALS

- A. All materials, whether hazardous or non-hazardous, shall be disposed in accordance with all laws and the provisions of this Section and all applicable federal, state, county or local regulations and guidelines. Assure compliance with all laws and regulations relating to this disposal.
- B. General Applicability.
 - 1. Contact the regional EPA, state, and local authorities to determine lead-containing or contaminated debris disposal requirements.
 - 2. The requirements of Resource Conservation and Recovery Act (RCRA) shall be complied with as well as California solid waste plan requirements. During lead-related work, do not leave debris on the property, incinerate debris, dump waste by the road or in an un-authorized dumpster, or introduce lead contaminated water into storm or sanitary sewers.
- C. Disposal Requirements.
 - 1. Dispose of the following materials as hazardous waste in accordance with this Section:
 - a. All paint chips and paint chip debris.
 - b. Lead-containing or contaminated materials exceeding regulatory thresholds.
 - 2. Test the following materials individually and provide results to District and Consultant, to determine whether they are to be considered hazardous.
 - a. Wastewater used to decontaminate.
 - b. Rags, sponges, mops, HEPA filters, respirator cartridges, and other materials used for lead-related work and clean-up and containment.
 - c. Other waste derived from work activities involving lead.
- D. Hazardous Waste Tests.
 - 1. Perform the Toxicity Characteristic Leaching Procedure (TCLP) to determine whether the wastes are classified as non-hazardous solid or hazardous waste as defined under RCRA. Representative samples shall be required of all material to be disposed.
 - 2. If any of these samples are above the TCLP regulatory limits, dispose of all of that type of material as hazardous waste.
 - a. Meet the requirements of the State of California, as per Title 22, CCR 66261 and other related regulations. This will include, if applicable, other waste testing, such as Total Threshold Limit Concentration (TTLC) and Soluble Threshold Limit Concentration (STLC).
 - b. Submit written manifest to District prior to removing any waste from the site and submit a complete manifest to District after waste is disposed of. The

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following documents are made applicable and part of this Section: 40 CFR 241, 257, 261, 262, and 49 CFR 172, 173, 178, and 179, Department of Transportation (DOT) Regulations.

- E. Disposal of Non-Hazardous Contaminated Solid Waste: The following procedures shall be followed for the disposal of all non-hazardous materials:
1. Place all non-hazardous contaminated materials in 6-mil polyethylene bags that are airtight and puncture resistant. Pieces of wood or other types of substrates that do not fit into plastic bags shall be wrapped and labeled "DANGER, LEAD DUST."
 2. Place all disposable cleaning materials, such as sponges, mop heads, filters, disposable clothing in 6 mil plastic bags and seal.
 3. Clean surfaces, equipment, and bag large debris. Remove plastic sheeting and tape from covered surfaces. Prior to removing the plastic sheeting, lightly mist the sheeting in order to keep dust down and fold inward to form tight bundles to bag for disposal. Place all plastic sheeting in 6-mil thick plastic bags and seal. Any bags shall be labeled "Danger, Lead Dust."
 4. Bag and seal vacuum bags and filters in 6-mil thick plastic bags.
 5. Place all contaminated clothing or work area clothing used during lead-related work, in 6-mil thick plastic bags for disposal prior to leaving the work area.
 6. Contain and properly dispose of all liquid waste, including lead dust-contaminated wastewater.
 7. HEPA vacuum the exterior of all liquid waste containers, prior to removing the waste containers from the work area, and wet wipe the containers to ensure that there is no residual contamination. Containers shall then be moved out of the work area into the designated storage area.
 8. Ensure that all waste is transported in covered vehicles to a landfill, or lined landfill, if available, in accordance with applicable DOT and EPA Regulations.
 9. Submit to the District and/or Consultant for approval, the waste transfer procedure, and route, and shall comply with all EPA and DOT regulations concerning hazardous and non-hazardous waste removal and transportation.
- F. Disposal of Hazardous Waste: The following procedures shall be followed for disposal of all material as hazardous waste:
1. Comply with the RCRA and with all applicable state and local regulations.
 2. Comply with all EPA regulations.
 3. Prepare for disposal as follows:
 - a. Packaged and sealed in containers approved under 49 CFR 173, 178, and 199.
 - b. Containers shall be numbered to correspond to the seal number, labeled with the type of materials, date it was filled and sealed, seal number, and weight of sealed container in addition to the information required under 49 CFR 172.
 - c. A log shall be prepared at time of filling, identifying each numbered container and the information from above. A copy of this log shall be turned

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- over to the Consultant within three working days after the containers are filled.
- d. Name, location, and telephone number of the disposal site used. A copy of the sites state and locally issued license, and a signed agreement that they will accept the hazardous lead waste, shall be provided to the Consultant.
 - e. Name, address, and telephone number of any waste subcontractors used. Provide copies of licenses and signed agreements to the Consultant.
 - f. Submit copies of the Hazardous Waste Manifest as required herein.
- 4. Waste Transportation: All Hazardous Waste shall be transported by a certified hazardous waste transporter. Require the certified hazardous waste transporter to follow RCRA and DOT regulations.
 - 5. Prior to the removal of any hazardous waste, the below listed information must be received in writing by the District and Consultant for their review and approval. Once approval is received from the District and Consultant, the waste may be transported as required.
 - a. Quantity of hazardous waste.
 - b. Type of waste materials.
 - c. Method of containerizing waste or waste treatment and appropriate licensing, certification and regulatory approvals.
 - d. Proposed waste hauler and disposal route.
 - e. Proposed waste disposal site or landfill.
 - 6. Receipts from the waste hauler and waste disposal site or landfill must be received and approved by District and Consultant per regulation.
- G. Storage Requirements: Any item found to be hazardous, by way of testing, shall be kept in a secured area or lockable and DOT approved container that is inaccessible to all persons other than lead-related work personnel. All hazardous waste shall be labeled "Hazardous Waste" and a date that the Contractor began to collect waste in that container. All hazardous and non-hazardous waste shall be kept in totally and completely separate containers. Until TCLP testing proves an item to be non-hazardous, all items shall be considered hazardous and stored in a secured area or lockable container.
 - H. Regulations: Comply with the RCRA and/or any other applicable federal, state, or county law, regulation and/or guidelines, whichever is most stringent.
 - I. Emergency Procedures: Keep and properly maintain a suitable fire extinguisher(s) on site; have an immediate means of communication with a regulatory agency in the event of an emergency; keep a list of phone numbers of regulatory agencies on site, make sure all employees know how to deal with all types of accidents, make one person who is always on site the emergency coordinator to ensure that emergency procedures are carried out in the event an emergency arises; and keep and maintain a "right to know" manual that is in an easily accessible location and in an area that is known to all employees.

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APPENDIX A

WORKSITE PREPARATION

Table 8.1 – Interior Worksite Preparation Levels (not including windows)

Description	Level 1	Level 2	Level 3	Level 4
Typical Applications (Hazard Controls)	Dust removal and any abatement or interim control method disturbing no more than 2 square feet of painted surface per room.	Any interim control or abatement method disturbing between 2 and 10 square feet of painted surface per room.	Same as Level 2.	Any interim control or abatement method disturbing more than 10 square feet per room.
Time Limit Per Building	One workday.	One workday.	Five workdays.	None.
Occupant Location	Inside building, but outside work area. Occupant must have lead-safe passage to bathroom, at least one living area, and entry/egress pathways. Alternatively, occupant can leave the dwelling during the workday.	Same as Level 1.	Outside the building; but can return in evening after day's work and cleanup are completed. Occupant must have safe passage to bathroom, at least one living area, and entry/egress pathways upon return. Alternatively, occupant can leave until all work is completed.	Outside the building for duration of project; cannot return until clearance has been achieved.
Containment and Barrier System	Single layer of plastic sheeting on floor extending 5 feet beyond the perimeter of the treated area in all directions. No plastic sheeting on doorways is required, but a low physical barrier (furniture, wood planking) to prevent inadvertent access is recommended. Children should not have access to	Two layers of plastic on entire floor. Plastic sheet with primitive airlock flap on all doorways. Doors secured from inside the work area need not be sealed. Children should not have access to plastic sheeting (suffocation hazard).	Two layers of plastic on entire floor. Plastic sheet with primitive airlock flap on all doorways to work areas. Doors secured from inside the work area need not be sealed. Overnight barrier should be locked or firmly secured. Children should not have access to plastic	Two layers of plastic on entire floor. If entire unit is being treated, cleaned, and cleared, individual room doorways need not be sealed. If only a few rooms are being treated, seal all doorways with primitive airlock flap to avoid cleaning entire unit. Doors

Table 8.1 – Interior Worksite Preparation Levels (not including windows)

Description	Level 1	Level 2	Level 3	Level 4
	plastic sheeting (suffocation hazard).		sheeting (suffocation hazard).	secured from inside the work area need not be sealed. Children should not have access to plastic sheeting (suffocation hazard).
Warning Signs	Required at entry to room but not on building (unless exterior work is also under way).	Same as Level 1.	Posted at main and secondary entryways.	Posted at building exterior near main and secondary entryways.
Ventilation System	Building ventilation system turned off, but vents need not be sealed with plastic if they are more than 5 feet away from the surface being treated. Negative pressure zones (with negative air machines) are not required, unless large supplies of fresh air must be admitted into the work area to control exposures to other hazardous substances (for example, solvent vapors).	Turned off and all vents in room sealed with plastic. Negative pressure zones (with negative air machines) are not required, unless large supplies of fresh air must be admitted into the work area to control exposure to other hazardous substances (for example, solvent vapors.)	Same as Level 2.	Same as Level 2.
Furniture	Left in place uncovered if furniture is more than 5 feet from working surface. If within 5 feet, furniture should be sealed with a single layer of plastic or moved for paint treatment. No covering is required for dust removal.	Removed from work area. Large items that cannot be moved can be sealed with a single layer of plastic sheeting and left in work area.	Same as Level 2.	Same as Level 2

Table 8.1 – Interior Worksite Preparation Levels (not including windows)

Description	Level 1	Level 2	Level 3	Level 4
Cleanup (See Section 3.4 for further details)	HEPA vacuum, wet wash and HEPA vacuum all surfaces and floors extending 5 feet in all directions from the treated surface. For dust removal work alone, a HEPA vacuum and wet wash cycle is adequate (i.e. no second pass with a HEPA vacuum). Also wet wash and HEPA vacuum floor in adjacent area(s) used as pathways to work area. Do not store debris inside building overnight; transfer to a locked secure area at the end of each day.	HEPA vacuum, wet wash and HEPA vacuum <i>all</i> surfaces in room. In addition, wet wash and HEPA vacuum floor in adjacent area(s) used as pathway to work area. Do not store debris inside building overnight; use a secure locked area.	Remove top layer or plastic from floor and discard. Keep bottom layer of plastic on floor for use on the next day. HEPA vacuum, wet wash and HEPA vacuum <i>all</i> surfaces in room. In addition, wet wash and HEPA vacuum floor in adjacent area(s) used as pathway to work area. Do not store debris inside building overnight; use a secure locked area.	Full HEPA vacuum, wet wash and HEPA vacuum cycle
Clearance Inspection/Dust Sampling	Visual clearance only.	If lead-based paint or presumed lead-based paint clearance inspection with single surface dust sampling	If lead-based paint or presumed lead-based paint clearance inspection with single surface dust sampling	If lead-based paint or presumed lead-based paint clearance inspection with single surface dust sampling

Note: Floor sanding and abrasive blasting on lead-based paint or presumed lead-based paint are not included in Table 8.1. Worksite preparation requirements are more stringent and area preparation must be approved by Consultant or District prior to beginning work.

END OF SECTION 02 83 33

SECTION 02 84 33
REMOVAL AND DISPOSAL OF UNIVERSAL WASTE AND PCB

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Hazardous Building Materials Survey Reports, prepared by the District's Consultant, are available from the District Construction Manager.

1.2 REFERENCE DOCUMENTS

- A. The current issue of the following documents are incorporated herein and shall govern the conduct of the Work. Where conflict among requirements or with this specification exists, the more stringent requirements shall apply.
- B. Code of Federal Regulations (CFR):
 - 1. 29 CFR 1910.134, Respiratory Protection.
 - 2. 40 CFR 273, Standards for Universal Waste Management.
 - 3. 49 CFR Parts 101, 106, 107, 171 to 180, The Transportation Safety Act, Hazardous Material Transportation Act.
- C. California Code of Regulations (CCR):
 - 1. Title 8, Division 1, Chapter 4, Construction Safety Orders.
 - 2. Title 8, Section 5144 Respiratory Protective Equipment.
 - 3. Title 22, Division 4.5, Hazardous Waste Management.
- D. State and Local Regulations: California Health and Safety Code, Division 20.

1.3 SUMMARY

- A. Section includes the abatement of potential hazards relating to materials falling under the RCRA Universal Waste Rule (UWR), materials potentially containing polychlorinated biphenyls (PCB), and UWR/PCB contaminated materials.
- B. Perform the work and provide service as needed to accomplish removal, containment, transport, and disposal of UWR/PCB containing/contaminated materials. Furnish all labor, materials, equipment, services, insurance (specifically covering the handling of

UWR/PCB waste), decontamination facilities, waste characterization testing services, and disposal of all UWR/PCB containing/contaminated materials, including:

1. Removal and disposal/recycling of potentially mercury-containing fluorescent light tubes from light fixtures and other non-incandescent light bulbs.
2. Removal and disposal/recycling of potentially mercury-containing switches from thermostats.
3. Removal and disposal/recycling of potentially tritium-containing exit signs.
4. Removal and disposal/recycling of potentially Freon™-containing air conditioning units and refrigeration systems.
5. Removal and disposal/recycling of lead/acid batteries.
6. Removal of all potentially PCB-containing ballasts from light fixtures. All light fixtures shall be visually inspected prior to removal or retrofitting to determine if they contain PCBs. Those ballasts marked as “No PCBs” or “PCB Free” shall be considered as such. Those ballasts that are unmarked shall be considered PCB containing and properly handled.
7. Proper cleanup and disposal of light fixtures if ballast oils have breached its container.
8. Removal and disposal/recycling of any building material falling under the Universal Waste Rule as indicated on the Drawings or as directed in writing by the District.
9. Placement of all contaminated items generated as a result of work activities and clean up in approved storage containers.
10. Proper packaging of all PCB or PCB-contaminated items including the use of an approved absorbent to contain any leaks that may occur during transportation to the disposal facility.
11. Marking and labeling of all UWR/PCB materials and items for storage and disposal/recycling purposes.
12. Transport of all UWR/PCB items, and containers to a disposal facility and/or to an approved off-site processing site for recycling.
13. Waste characterization of all building materials removed from the site.
14. Recordkeeping in accordance with all applicable local, state, and federal regulations.
15. Preparing manifests, bills of lading, and all other required documentation for transportation, processing, and disposal of UWR/PCB for signature by the District.

C. Related Requirements:

1. Section 02 82 33 “Removal and Disposal of Asbestos Containing Materials” for asbestos abatement.
2. Section 02 83 33 “Removal and Disposal of Materials Containing Lead” for lead abatement.

1.4 ALLOWANCES

- A. Allowances for removal and disposal of UWR/PCB items are specified in Section 01 21 00 “Allowances.”

1.5 ACTION SUBMITTALS

- A. Product Data: For absorbent, solvent, and/or cleaning agent.

1.6 INFORMATION SUBMITTALS

- A. Site Specific Work Plan describing procedures, products and materials for the containment of the regulated work area (where appropriate), removal of UWR and PCB-containing/contaminated liquids and solids, decontamination of equipment and disposal of equipment that contained UWR and PCBs, waste storage containers, spill clean-up, personnel decontamination, emergency contact numbers and procedures, first aid treatment, and temporary on-site storage procedures. This work plan shall include the names and daytime phone numbers of all key personnel, the location of all required on-site documentation and emergency equipment, and delineation of the work area. A generalized, "boiler-plate" type of plan will not be accepted. The Plan shall include minimally the following:
1. Overall Statement: Overall statement of procedures proposed for use in complying with the regulations and requirements included in this specification.
 2. Quality Assurance Program: A description of the program, to include at a minimum:
 - a. Control Measures: Measures to assure control of unsafe or unhealthy conditions; prevent spills or leaks, damage to the building or its furnishings; avoid buildup of UWR/PCB containing/contaminated materials; and ensure reliability of sampling and analysis.
 - b. Cleanup: Waste cleanup procedures and disposal plan, including on-site waste packaging method (e.g., scooping and bagging, vacuum hose transfer with small (or large) bagging, etc.); name and description of any on-site waste transfer equipment, including evidence of training and experience in its use, and description of decontamination unit around any such equipment to be located outside the work area; name and location of disposal site(s), each having an EPA Identification Number as a hazardous waste disposal site; and copies of applicable Identification Numbers, certificates and registrations for hazardous waste transporter(s), transferer(s), treater(s) and disposal site(s), and converter(s).
 - c. Pollution Control: Detailed description of the methods to be employed to control pollution and minimize generation of hazardous and non-hazardous waste.
 - d. Protection of occupants and visitors. Methods to be used to assure the safety and health of building occupants and visitors at the site from the effects of the work.
 3. Emergency Preparedness:
 - a. Emergency Procedures: Procedures to be followed in the event of critical circumstances, including fire, electric shock, life-threatening -bodily injury inside or outside of the containment area, a major breach in the

REMOVAL AND DISPOSAL OF UNIVERSAL WASTE AND PCB**02 84 33 - 3****DEHESA SCHOOL MODERNIZATION**

- containment barrier, the detection of airborne contamination or debris outside of the containment area, splitting or spilling of waste containers en route to a waste vehicle.
- b. Emergency Contact Information: Contact information, including a list of names and telephone numbers (with area codes) of the Contractor's contact persons, the District, or other contact persons as designated by the District, the fire department, police department, general emergency number (if used), and local hospital or similar emergency care unit available at all times work is to be performed. A copy of this emergency contact information is to be kept at the job site, available for inspection by the District and/or an Authorized Visitor, and updated as required.
 - c. Contingency Plan: A plan that addresses procedures to be followed should work area containment be breached, a release of hazardous materials occur, visual inspection or air monitoring clearance criteria for a work area not be met in a timely manner, etc.
4. Materials:
- a. List of materials to be used, including such items as protective clothing, respiratory protection, absorbents, solvents, waste storage containers, item containers, and all appurtenances.
5. Safety Data Sheets (SDS):
- a. Safety Data Sheets for any materials to be brought to the site for which SDS's are provided by the manufacturers or distributors. For items for which an SDS is not available, submit the name of the manufacturer, brand name, and catalog/part number for each item.
6. Performance: A statement describing the proposed organization of the work, including:
- a. Sequencing of work.
 - b. Shifts: Length and projected times of day of work shifts.
 - c. Interfacing: Interface of trades involved in the work.
 - d. Special procedures: A detailed description of any proposed methods of special abatement procedures, where used. Submit manufacturer's technical specifications and product description literature for the methods and equipment used.
7. Protective Equipment: A Protective Equipment (PPE) Program including a Respiratory Protection Program, to include:
- a. Equipment: A list of all equipment, tools, and materials available for use on this project.
 - b. Medical Surveillance: A description of the Contractor's medical surveillance program for persons under the supervisory control of the Contractor who may be occupationally exposed to hazardous substances

under this contract. Minimal qualifications shall be as specified in 29 CFR 1910.134 and 8 CCR 5144.

- B. Qualification Data: For abatement contractor and waste hauler.
- C. Copy of waste hauler license.
- D. Contractor's USEPA identification number.
- E. Disposal Manifests:
 - 1. Original manifests and receipts acknowledging disposal of all hazardous and non-hazardous waste material from the project showing delivery date, quantity, and appropriate signature of landfill's authorized representative.
 - a. Submit within 30 days of date that material was transported off site.

1.7 CLOSEOUT SUBMITTALS

- A. Submit immediately upon completion of abatement work:
 - 1. Compliance certificate verifying that all UWR/PCB wastes have been properly treated and disposed of.
 - 2. Original manifests, permits, or other documents currently in effect relating to the specific UWR/PCB wastes transported, treated, and disposed of, except as otherwise stated in this Section.
 - a. Submit within 30 days of date that material was transported off site.
 - 3. A copy of all final manifests. (As the waste generator, the District will sign the complete waste manifests, upon approval, for all UWR/PCB items/wastes generated during the course of this project. These manifests will accompany the waste loads to disposal and be properly completed by the hauler and disposal agent, as required under federal and state hazardous waste management statutes. Return the final manifest to the District by registered mail within the designated time period under federal statutes.)
 - 4. Certifications of incineration (for fluids) and/or recycling.
 - 5. Records and storage data to include:
 - a. Name of the firm performing the work of this section and technician in charge.
 - b. Number and size of drums and other storage containers.
 - c. Weight in kilograms or gallons of content for each drum or other storage container.
 - d. Date placed in storage.

1.8 PERFORMANCE REQUIREMENTS

A. Project Supervision:

1. Provide English-speaking on-site Supervisor who is experienced, trained, knowledgeable, and qualified in the techniques of UWR/PCB abatement, handling of UWR/PCB waste and UWR/PCB-contaminated materials, and cleaning of UWR/PCB-contaminated areas.

B. Protection of Persons and Property:**1. General Safety Requirements:**

- a. Initiate, maintain, and supervise all safety precautions and programs in connection with the Work.
- b. Take all precautions and measures required to protect employees, inspection personnel, the District, the District's Representative, and the public from exposure to UWR/PCB solids, liquids, and vapors.
- c. All personnel authorized for entry into the work areas shall be instructed in the proper procedures for working with or around electrical hazards and UWR/PCB containing/contaminated materials.
- d. All electrical equipment, upon which UWR/PCB-related activities are to be performed, shall be de-energized, locked out/tagged out, and permanently disconnected from any power source prior to the commencement of work.
- e. Consumption of food or tobacco products shall not be permitted in any of the work areas where UWR/PCB materials, volatile solvents, or other hazardous materials are present. In addition, no open flames shall be permitted in these areas. Signage to this effect shall be posted at each entry and exit from the work areas.

C. Work Area Protection and Demarcation:

1. Prior to commencing any UWR/PCB-related work activities, provide barricades, roping, and warning signs to clearly identify and effectively guard against unauthorized entry into the work area.
 - a. At a minimum, barricades shall consist of yellow sawhorses, set end-to-end.
 - b. Ropes are to be yellow in color and supported by the use of weighted bottom pipe type supports.
 - c. Warning signs shall be suspended from the rope and placed at intervals of approximately 10 feet. Warning signs for the work area shall be approximately 18 inches square, with a yellow background and black lettering. Signs shall read "DANGER - KEEP OUT - TOXIC CHEMICAL WORK AREA."
 - d. Place barricades in order to maintain a minimum of 25 feet from all perimeters of the work being conducted to the barricades, where feasible.
2. Confine all equipment, such as tools and containers, to the work area until the work is complete, containers are sealed, and equipment has been properly decontaminated and safely stored for transport.

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D. Personal Protective Clothing, Equipment, and Personal Protective Procedures:

1. At all, times when UWR/PCB fluids or mixtures in any volume are not sealed in drums, containers, or electrical equipment, workers shall wear the following:
 - a. Gloves impermeable to both UWR/PCB and the clean-up agent in use.
 - b. Disposable coverall, impermeable to both UWR/PCB and the clean-up agent in use.
 - c. Appropriate eye protection to ensure that eyes are protected from liquid splatter or exposure to concentrated vapors or fumes.
 - d. If appropriate, respiratory protection appropriate for the concentration of the hazardous material(s) present and atmosphere present. If utilized, supplied air must meet the requirements for Grade D air, at a minimum.
2. Provide protective clothing, eye protection, and breathing apparatus, as required for authorized inspection personnel, the District, and other authorized personnel upon request.
3. The UWR/PCB work area shall not be left unattended from the start of work activities until all UWR/PCB and incidentals have been sealed in approved containers. If immediate transportation to a UWR/PCB storage facility or disposal facility is not feasible, the work area must be secured in a manner approved by the District.
4. During work procedures and at all, times when UWR/PCB-containing/contaminated fluids in any volume are not sealed in drums, containers, or electrical equipment, all personnel entering the work area must don protective clothing and equipment. Upon exiting the work area, all disposable protective clothing shall be stored in appropriate waste storage drums and sealed, for subsequent transportation to the on-site storage facility or disposal facility.
5. Workers with cuts or scratches shall cover these wounds sufficiently to prevent accidental contact with hazardous materials within the regulated work area, prior to entering the regulated work area. Similarly, workers who incur accidental minor cuts or scratches in the course of work activities will immediately leave the work area, cleanse the wound with medical grade soap, and seal the wound before returning to the work area.

1.9 QUALITY ASSURANCE

- A. Single Party Responsibility: The contractor performing the work shall be responsible for, and shall accomplish all, UWR/PCB-related work activities.
- B. Abatement Contractor Qualifications: The Contractor shall be fully experienced in the handling, storage, and transport of UWR, UWR-contaminated articles, and PCB-related waste, and shall warrant to the District that he/she is familiar with the codes and requirements applicable to UWR/PCB work.

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- C. Waste Hauler Qualifications: Currently licensed by the State of California Department of Public Health for the transporting, handling, and hauling of extremely hazardous wastes, including UWR/PCB-related wastes.

PART 2 - PRODUCTS**2.1 GENERAL**

- A. No materials, equipment, or tools belonging to the District shall be used by the Contractor, except in case of an emergency and upon explicit authorization by the District.
- B. Deliver all materials and equipment to the site in the original containers bearing the name of the manufacturer and details for proper storage and usage.
- C. All materials or equipment delivered to the site shall be unloaded, temporarily stored, and transferred to the work area in a manner, which shall not interfere with operations of the District.
- D. The District and/or Consultant must approve unloading and temporary storage sites and transfer routes in advance.
- E. Damaged or deteriorated materials may not be used and must be promptly removed from the project site.
- F. All materials, tools, and equipment must comply at a minimum with this specification and all applicable federal, state, and local regulations.

2.2 MATERIALS

- A. Storage Containers:
 - 1. All UWR/PCB fluids and UWR/PCB-contaminated fluids, including flush and cleaning solvents and mixtures, shall be stored in sealed Department of Transportation (DOT) 17E closed top drums or other waste container approved for the storage of these materials.
 - 2. For the purposes of this Section, PCB-contaminated fluids are defined as containing more than 5 but less than 500 parts per million (ppm) PCBs. PCB fluids are defined as containing PCBs in concentration of 500 ppm or greater. Flush solvents shall be assumed to contain more than 500 ppm PCBs.
 - 3. All UWR/PCB soil wastes and items used in the course of work, such as rags, absorbents, and protective clothing, shall be stored in sealed DOT 17C open type drums or other waste container approved for the storage of these materials.
- B. Solvents, Cleaning Agents, and Absorbents:

1. Select an appropriate solvent in which UWR are shown to be soluble. Select an appropriate solvent, in which PCBs are shown to be at least 5% soluble, by weight. Solvents specified by the USEPA include: kerosene, diesel fuel, terpene hydrocarbons, and a mixture of terpene hydrocarbons and terpene alcohols. Care shall be taken to limit the complexity of the waste stream. In all cases where solvents are used in the course of work, provide proper ventilation to ensure that the resulting fumes/vapors are not dispersed to occupied building areas either as a result of natural convection or via air intakes for building ventilation systems.
2. The manufacturer's recommendations for applications and requirements for California Occupational Safety and Health Administration (Cal OSHA) shall be strictly observed.
3. Select an appropriate cleaning agent in which UWR are shown to be soluble. Select an appropriate cleaning agent, in which PCBs are shown to be at least 5% soluble, by weight. Care shall be taken to limit the complexity of the waste stream. Numerous non-toxic cleaning agents, shown to meet or exceed the solubility standard, are commercially available. In all cases where cleaning agents are used in the course of work, provide proper ventilation to ensure that the resulting fumes/vapors are not dispersed to occupied building areas either as a result of natural convection or via air intakes for building ventilation systems. The manufacturer's recommendations for applications and requirements for Cal-OSHA shall be strictly observed.
4. Select an appropriate absorbent.

PART 3 - EXECUTION

3.1 SPILL CLEAN-UP, CONTAINERIZATION, AND MARKING

A. Clean-up of Work Area, UWR/PCB, and Spills:

1. After the last UWR/PCB-containing light ballast has been removed and all fluids and solids have been cleaned from the fixture, all tools and equipment used in the work shall be decontaminated and properly stored for future use.
2. All tools that have come into contact with UWR/PCBs at any concentration will be double washed/rinsed with an appropriate cleaning agent, wiped cleaned, and properly stored.
3. At a minimum, all exterior surfaces of equipment that may have come into contact with UWR/PCBs or contaminated solids or fluids either during the course of work activities or due to past leaks will be double washed/rinsed with an appropriate cleaning agent and wiped clean.
4. All metal surfaces and surfaces with impermeable liners which have come into contact with UWR/PCBs or UWR/PCB mixtures in the course of work or as a result of past leaks shall be thoroughly cleaned using combinations of absorbents and solvents or cleaning agents. Minimum cleaning requirements for these surfaces will include the removal of bulk material and two rinses with the cleaning agent for the affected surfaces. The work area shall be effectively ventilated during operations such that vapors used during decontamination and cleaning

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are not vented to occupied building areas. Upon completion of UWR/PCB-related activities, if fumes or vapors are still present in levels that could impede breathing or be considered toxic under state and/or National Institute of Occupational Safety and Health (NIOSH) standards, the Contractor shall provide additional ventilation to accelerate drying. If needed, auxiliary breathing apparatus may only be used by personnel trained in the use of this equipment and experienced in conducting UWR/PCB-related work while wearing such apparatus, which can impede safe work practices.

5. The USEPA, Region IX, regards soil, asphalt, wood, cement, and concrete as porous materials that absorb UWR/PCBs. Where practical, these materials must be removed when they are within the spill or contamination boundary.
6. Completion of decontamination activities shall be inspected by the Contractor's Environmental Monitor, by collecting an appropriate number and type of samples for the specific UWR and/or PCBs and surfaces. The Contractor is responsible for all cost associated with spill clean-up and oversight.

B. Containerization and Marking:

1. All liquids generated as a result of work activities and clean-up operation shall be placed in appropriate work containers and the containers sealed.
2. All solids, such as absorbents, rags, disposable clothing, soil, and other incidentals, shall be placed in appropriate work containers and the containers sealed.
3. All drums and items containers utilized shall be permanently marked as to the specific contents and dated. In addition, each drum and container shall be marked with the standard Environmental Protection Agency, UWR or PCB label, as appropriate (40 CFR 273) and Hazardous Waste label (40 CFR 262).

3.2 HANDLING AND TRANSPORTATION TO STORAGE FACILITIES

A. All closed and open top drums must be permanently sealed and marked prior to loading on the transport vehicle. Filled drums shall be loaded onto the transport vehicle by the following methods:

1. By a hoist or lift truck capable of utilizing a two-point drum lifter;
2. By a hoist or lift truck provided with a band-around type drum lifter; or
3. By a lift truck, lifting the drums from underneath by a pallet attached to the drum by a banding arrangement.
4. HEPA vacuum all surfaces in the work area, including walls, ceilings, windows, and floors.

B. The drums shall not be lifted by:

1. Any rope, chain, or cloth slings tied about the drum;
2. Placement of drums on bare fork lift trucks;
3. Forcing drums between the forks of a lift truck; or
4. Any commercial drum lifter exerting force on the sides of the drums.

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- C. All drums and containers shall be secured to the transport vehicle to prevent movement while in transit.
- D. Transportation:
 - 1. All UWR/PCB items and drums containing liquids, solids, and incidentals shall be transported to an off-site UWR/PCB-approved and permitted recycling/disposal facility.
 - 2. The Contractor performing this section of the work shall be licensed for the transport and hauling of extremely hazardous waste. Provide a route plan that clearly identifies the routes proposed while transporting UWR/PCB items from the various work sites to off-site facilities.
 - 3. A minimum of two operators shall be in attendance at all times while UWR/PCB items are being transported, loaded, and unloaded.
 - 4. A motor carrier driver or other person must comply with the Federal Motor Carrier Safety Rules when he/she is transporting UWR, PCB, or other hazardous materials by a motor vehicle, which must be placarded or marked in accordance with DOT 177.
 - 5. Every motor vehicle transporting or storing items containing UWR, PCB, or other hazardous materials must be operated and parked in compliance with the law, ordinances, and regulations of the state jurisdiction of which it is being operated in, unless they are at variance with specific regulations of the DOT which are applicable to the operation of that vehicle and impose a more stringent obligation or restraint.
 - 6. All containers must be properly secured in place to ensure that no equipment items or containers can come loose or are unsafely placed into the transport vehicle. This may include chaining, roping, strapping, or winching. The driver of the vehicle must stop the vehicle in a safe location at least once during each two hours or 100 miles traveled, whichever is less, and inspect the contents of the shipment. At the time of inspection, if any form of binding is found to be loose, the driver shall immediately take action to remedy the situation for safe transportation.
 - 7. Any equipment, drums, or other items carried in an open, flatbed, or stake type truck shall be covered with a tarp to protect it from the elements.
 - 8. A motor carrier that transports "Hazardous Waste" must furnish the driver of each motor vehicle the following documents:
 - a. A copy of this Section.
 - b. A document containing instruction on procedures to be followed in the case of an accident or delay. The documents must include the names and telephone numbers of the people to be contacted, the types of hazardous wastes being transported, and the precautions taken in emergencies, such as fires, accidents, or leakages.
 - c. Manifest and permit documents described in these specifications and required for waste transport.
 - 9. A motor vehicle being operated must be marked if that vehicle is:

- a. Transporting UWR, PCBs, or hazardous materials of a kind that require the vehicle be marked or placarded in accordance with DOT 177;
- b. Commercial vehicles must display the name or trade name of the carrier operating the vehicle. These vehicles must display markings that designate the carrier as being a commercial vehicle "for hire."

3.3 UWR/PCB DISPOSAL

- A. Treat and dispose of all UWR/PCB wastes collected and generated during the execution of the Work.
- B. Except as may be otherwise specifically directed in writing by the District Construction Manager, treat and dispose of all waste UWR/PCB materials as governed by 40 CFR 273, California State Regulations, local regulations, and subsequent amendments).
 1. All UWR fluids, flushing fluids, and other UWR contaminants shall be disposed of by incineration or recycling at a facility approved for such use by the USEPA, and all other controlling regulatory agencies and bodies of the state, county, and municipality of that facility's location. If the Contractor so elects, solid UWR wastes may also be incinerated, as suitable and allowed for this type of disposal.
 2. All PCB fluids, flushing fluids, waste oils, and other fluid contaminants whose total PCB content is equal to or greater than 5 ppm (and are therefore restricted to this mode of thermal destruction) shall be disposed of by incineration or recycling at a facility approved for such use by the USEPA, and all other controlling regulatory agencies and bodies of the state, county, and municipality of that facility's location. If the Contractor so elects, solid PCB wastes may also be incinerated, as suitable and allowed for this type of disposal.
- C. Dispose of all UWR/PCB wastes generated as part of these operations in a legal manner.
- D. Do not sell, transfer, or recover any material from the wastes received from the Project without their prior written consent from the District.

3.4 UNLOADING AND PLACING IN STORAGE

- A. Transport vehicles shall be unloaded using the same equipment and methods as for loading (Section 3.2.A and 3.2.B).
- B. Materials shall only be placed in temporary storage if approved in writing by the District Construction Manager.
 1. Drums and other storage containers shall be placed in a storage facility in locations designated by the District.
 2. Drums shall be placed on pallets of sufficient strength to withstand double stacking. Drums shall not be stacked at the time of storage, unless space is

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limited as determined by the District. Where stacking of drums is necessary, pallets shall be placed between the drum layers.

3. Ample clearance space will be provided around other storage containers in order to facilitate inspection.
- C. Immediately following the unloading of UWR/PCB transport vehicle, inspect the cargo area to check for any fluid leaks. If any fluids are found, the source of the leaking drum or other storage container shall be identified and sealed.
- D. Thoroughly wash/rinse clean with absorbents, solvents, and liquid cleaners the contaminated cargo area. Cleaning agent, solvents, and solids shall be placed in proper drums for disposal.

END OF SECTION 02 84 33

**SECTION 03 30 00
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.3 REGULATORY REQUIREMENTS

- A. Conform to the California Building Code (CBC), 2022 edition

1.4 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.5 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site a minimum of two weeks before Work in this Section is to commence.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.

- d. Concrete Subcontractor.
- e. Vapor Emissions Control System Representative

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
 - 2. Include Vapor Emissions Control System.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Project Inspector.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Fiber reinforcement.
 - 6. Curing compounds.
 - 7. Floor and slab treatments.
 - 8. Bonding agents.
 - 9. Adhesives.
 - 10. Vapor retarders.
 - 11. Semi-rigid joint filler.
 - 12. Joint-filler strips.
 - 13. Repair materials.
 - 14. Vapor Emissions Control System.

- D. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- E. Minutes of pre-installation conference.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. 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."
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.
- D. Regulatory Requirements: Concrete construction shall conform with the CBC, and requirements specified herein.

1.9 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: District will engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1.11 FIELD CONDITIONS

- A. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 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"
 - 3. ACI 318.14 Building Code Requirements for Structural Concrete.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4-by-3/4-inch, minimum.
- E. 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.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Steel Bar Mats: ASTM A 184/A 184 M, fabricated from ASTM A 615/A 615M, Grade 60 deformed bars assembled with clips.
- D. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.

- E. Deformed-Steel Wire: ASTM A 1064/A 1064M.
- F. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- G. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, 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. 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:
 - 1. 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.
 - 2. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 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 components (admixture, curing agent, crack fill binder) from single source from single manufacturer
 - 4. Obtain all other admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, **Type II gray**
 - 2. Fly Ash: ASTM C 618, Class F.
 - 3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
 - 4. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 1N coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal, nor one third of the slab depth, not three-fourths of the minimum clear spacing between individual reinforcing bars or bundles of bars.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 3. Do not use aggregates containing spalling causing deleterious substances.
- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures, flooring materials and adhesives, and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- E. Water: ASTM C 94/C 94M and potable.
- a. Or Equal.
- 2.6 VAPOR RETARDERS
- A. Vapor Retarder: Plastic sheet, ASTM E 1745, Class A.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fortifiber Building Systems Group.
 - b. Raven Industries, Inc.
 - c. Reef Industries, Inc.
 - d. Stego Industries, LLC.
 - e. W.R. Meadows, Inc.
- B. Provide required under slab vapor barrier accessories from same manufacturer as vapor barrier.
1. Seam Tape
 - a. High Density Polyethylene Tape with pressure sensitive adhesive . Minimum width 4 inches.
 2. Pipe Collars
 - a. Construct pipe collars from vapor retarder material and pressure sensitive tape per manufacturer's instructions.

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation-Construction Systems.
 - b. Euclid Chemical Company (The); an RPM company.
 - c. Sika Corporation.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating, conforming to VOC requirements of the San Diego Air Pollution Control District.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, conforming to VOC requirements of the San Diego Air Pollution Control District[, certified by curing compound manufacturer to not interfere with bonding of floor covering].

2.8 RELATED MATERIALS

- A. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- D. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not 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.

2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8-inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150/C 150M, Portland cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8- to 1/4-inch or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4100 psi strength at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4-inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150/C 150M, Portland cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8- to 1/4-inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5000 psi strength at 28 days when tested according to ASTM C 109/C 109M.

2.10 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. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
1. Fly Ash: 15 percent.
 2. Combined Fly Ash and Pozzolan: 15 percent.
 3. Slag Cement: 40 percent.
 4. Combined Fly Ash or Pozzolan and Slag Cement: 40 percent Portland cement minimum, with fly ash or pozzolan not exceeding 15 percent.
 5. Silica Fume: 10 percent.
 6. Combined Fly Ash, Pozzolans, and Silica Fume: 25 percent with fly ash or pozzolans not exceeding 15 percent and silica fume not exceeding 10 percent.

7. Combined Fly Ash or Pozzolans, Slag Cement, and Silica Fume: 40 percent with fly ash or pozzolans not exceeding 15 percent and silica fume not exceeding 10 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.1 percent by weight of cement.
- D. Admixtures: Use admixtures certified by manufacturer to be compatible with other admixtures, flooring materials and adhesives. Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.45.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Slabs-on-Grade: Normal-weight concrete.
 1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Maximum W/C Ratio: 0.45.
 3. Minimum Cementitious Materials Content: 520 lb/cu. yd..
 4. Slump Limit: 4 inches, plus or minus 1/2-inch.
 5. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 6. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
 7. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
 8. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd. .

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 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.
- B. Batch Plant Inspection may be waived provided the concrete plant complies fully with the requirements of ASTM C94, Sections 819, and has been certified by an agency acceptable to O.S.H.P.D. to comply with the requirements of the "National Ready Mixed Concrete Association". The plant must be equipped with an automatic batcher in which the total batching cycle, except for measuring and introduction of an admixture, is completed by activating a single starter device.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. 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.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 1. Class A, 1/8-inch for smooth-formed finished surfaces.
 2. Class C, 1/2-inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- 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. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 2. 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.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

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 at least 75 percent of 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.
 - 3. Determine compressive strength of in-place concrete by testing representative field or laboratory-cured test specimens according to ACI 301.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. 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.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the Project Inspector.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-third of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8-inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2-inch or more than 1-inch below finished concrete surface where joint sealants, specified in Section 07 92 00 "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: 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.
- 3.7 CONCRETE PLACEMENT
- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
 - B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by the Project Inspector.

- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. 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. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. 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.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.8 FINISHING FORMED SURFACES

- A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film finish coating system. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - 2. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8-inch.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a heavy broom finish to exterior concrete steps, ramps and surfaces.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.10 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. 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.

3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by the District Construction Manager. Remove and replace concrete that cannot be repaired and patched to District Construction Manager'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. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2-inch in any dimension to solid concrete. Limit cut depth to 3/4-inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by the District Construction Manager.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high

areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01-inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4- inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas and test cores, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Cracks
 - a. Repair random cracks and single holes 1 inch or less in diameter.
 - b. General: Repair with patching mortar.
 - c. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place crack repair material before bonding agent has dried. Compact crack repair material and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to District Construction Manager's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to District Construction Manager's approval.

3.14 FIELD QUALITY CONTROL

- A. Special Inspections: District will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Concrete Slab Vapor Emissions Tests: Before installation of flooring finishes over interior concrete slabs, District will have concrete floor slab moisture content tests performed by an independent laboratory to determine the level of vapor transmission in the concrete slabs, slab strength, permeability, pH level and relative humidity. District will submit copies of the test results to the Architect, Project Inspector, and Contractor prior to the installation of the flooring finishes.
- D. Inspections:
 - 1. Steel reinforcement placement.
 - 2. Steel reinforcement welding.
 - 3. Headed bolts and studs.
 - 4. Verification of use of required design mixture.
 - 5. Concrete placement, including conveying and depositing.
 - 6. Curing procedures and maintenance of curing temperature.
 - 7. Verification of concrete strength before removal of shores and forms from beams and slabs.

3.15 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 03 30 00

**SECTION 05 50 00
METAL FABRICATIONS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel framing and supports for countertops.
 - 2. Steel framing and supports for mechanical and electrical equipment.
 - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 4. Steel pipe columns for supporting wood frame construction.
 - 5. Shelf angles.
 - 6. Metal floor plate and supports.
 - 7. Structural-steel door frames.
 - 8. Miscellaneous steel trim including steel angle corner guards and steel edgings.
 - 9. Loose bearing and leveling plates for applications where they are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 - 3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
 - 2. Section 04 22 00 "Concrete Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
 - 3. Section 05 12 00 "Structural Steel Framing."
 - 4. Section 32 93 00 "Plants" for tree grates.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. Grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
 - 1. Steel framing and supports for countertops.
 - 2. Steel framing and supports for mechanical and electrical equipment.
 - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 4. Steel pipe columns for supporting wood frame construction.
 - 5. Shelf angles.
 - 6. Metal floor plate and supports.
 - 7. Structural-steel door frames.
 - 8. Miscellaneous steel trim including steel angle corner guards and steel edgings
 - 9. Loose steel lintels.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

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

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Aluminum Ladders: Aluminum ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.
- D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- F. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
- G. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

- H. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- I. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: As indicated.
 - 2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.
 - 3. Material: Cold-rolled steel, ASTM A 1008/A 1008M, structural steel, Grade 33; 0.0966-inch minimum thickness hot-dip galvanized after fabrication.
- J. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- K. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- L. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- M. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- N. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- O. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
 - 3. Provide stainless-steel fasteners for fastening nickel silver.
 - 4. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1 .
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

- E. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- F. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- H. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8-by-7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS.

- A. Shop Primers: Provide primers that comply with Section 09 91 13 "Exterior Painting." And Section 09 91 23 Interior Painting."
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Epoxy Zinc-Rich Primer: Compatible with topcoat.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carboline Company.
 - b. PPG Paints.
 - c. Rust-Oleum.
 - d. Sherwin-Williams Company.
 - e. Or Equal.
- D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- H. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32-inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8-by-1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.
 - 1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
 - 2. Unless otherwise indicated, provide 1/2-inch baseplates with four 5/8-inch anchor bolts and 1/4-inch top plates.
- E. Galvanize miscellaneous framing and supports where indicated.
- F. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize shelf angles located in exterior walls.
- D. Prime shelf angles located in exterior walls with zinc-rich primer.
- E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL FLOOR PLATE

- A. Fabricate from rolled-steel floor plate of thickness indicated below:
1. Thickness: 1/4-inch or as indicated.
- B. Provide grating sections where indicated fabricated from welded or pressure-locked steel bar grating . Limit openings in gratings to no more than 1/2-inch in least dimension.
- C. Provide steel angle supports as indicated.
- D. Include steel angle stiffeners, and fixed and removable sections as indicated.

2.9 STRUCTURAL-STEEL DOOR FRAMES

- A. Fabricate structural-steel door frames from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with 5/8-by-1-1/2-inch steel channel stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than 10 inches o.c. Reinforce frames and drill and tap as necessary to accept finish hardware.
1. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.
- B. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.
- C. Galvanize exterior steel frames where indicated.
- D. Prime interior steel frames with zinc-rich primer where indicated.

2.10 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize exterior miscellaneous steel trim where indicated.
- D. Prime interior miscellaneous steel trim with zinc-rich primer where indicated.

2.11 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.
- C. Prime plates with zinc-rich primer.

2.12 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.13 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.14 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.15 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer.
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.16 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.
- B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION**3.1 INSTALLATION, GENERAL**

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 13 "Exterior Painting." And Section 09 91 23 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 05 50 00

**SECTION 05 52 13
PIPE AND TUBE RAILINGS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications" for metal requirements.

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel pipe and tube railings for drinking fountain alcove/cane protection.

1.3 COORDINATION

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Railing brackets.
 - 2. Grout and anchoring cement.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- D. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code 2022 edition; CBC Section 11B

1.7 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lb applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

- a. Concentrated load of 50 lb applied horizontally on an area of 1 sq. ft.
- b. Infill load and other loads need not be assumed to act concurrently.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

- 1. Temperature Change: 120 deg F, ambient; 180 deg F.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 STEEL AND IRON

- A. Tubing: ASTM A 500 (cold formed).
- B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.4 FASTENERS

- A. General: Provide the following:
 - 1. Hot-Dip Galvanized Railings: Hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
 3. Provide tamper-resistant square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.5 MISCELLANEOUS MATERIALS

- A. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- D. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32-inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Form Changes in Direction as Follows:
 - 1. As detailed.
 - 2. By mitering at elbow bends.
 - 3. By flush bends.
 - 4. By radius bends of radius indicated.
- J. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to

structural supports and prevent bracket or fitting rotation and crushing of substrate.

- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2-inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.7 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware..
 - 4. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Set posts plumb within a tolerance of 1/16-inch in 3 feet.
 - 2. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4-inch in 12 feet.

- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4-inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.
- D. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.
- E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
- F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

- A. Anchor protective railing at drinking fountain as indicated in the drawings.

3.6 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 05 52 13

**SECTION 06 10 00
ROUGH CARPENTRY**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Framing with timber.
 - 3. Rooftop equipment bases and support curbs.
 - 4. Wood blocking and nailers.
 - 5. Wood furring and grounds.
 - 6. Wood sleepers.
 - 7. Plywood backing panels.
- B. Related Requirements:
 - 1. Section 06 16 00 "Sheathing" for sheathing, subflooring, and underlayment.
 - 2. Section 06 20 13 "Exterior Finish Carpentry"
 - 3. Section 06 4116 "Plastic-Laminate Clad Architectural Cabinets"

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. OSB: Oriented strand board.
- E. Timber: Lumber of 5 inches nominal size or greater in least dimension.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Engineered wood products.
 - 4. Shear panels.
 - 5. Power-driven fasteners.
 - 6. Post-installed anchors.
 - 7. Metal framing anchors.
- B. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.

1.6 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) 2022 edition.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having

jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

- B. Inspection Agencies: Inspection agencies, and the reference abbreviations include the following:
 - 1. RIS: Redwood Inspection Service.
 - 2. WCLIB: West Coast Lumber Inspection Bureau.
 - 3. WWPA: Western Woods Products Association.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

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, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber 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. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 - 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- 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.
 - 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

SPECIFICATION

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- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that 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.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- D. Application: Pressure treat above ground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat items indicated on Drawings, and the following:
 - 1. Wood nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING (Per CBC Chapter 23 and SHT.S1.1 Wood Notes)

- A. All wood members shall be Douglas Fir (DF) or Larch Grade Marked by a recognized Grading Agency WCLIB & WWPA.
- B. Wood Grades.
 - 1. For Horizontal Members: 2X4 sub-purlins: Grade #1 (For panelized construction)
 - 3X and larger Beams and Headers: Grade #1
 - 2. For Vertical Members:
 - 2X: Grade #2
 - 2X and 3X Studs: Grade #2
 - 4X and Larger Studs and Posts: Grade #1

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Furring.
5. Grounds.

B. Dimension Lumber Items: No. 2 grade lumber of the following species:

1. Douglas Fir or Larch Grade
2. Western woods; WCLIB or WWPA.

C. Concealed Boards: 19 percent maximum moisture content and the following species and grades:

1. Douglas Fir or Larch No. 2 Common grade; WCLIB, or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 2 grade lumber may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough 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 Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193, or ICC-ES AC308 as appropriate for the substrate.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.
- E. Wood Screws: ASME B18.6.1.
- F. Lag Bolts: ASME B18.2.1.
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

2.7 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. KC Metals Products, Inc.
 - 2. Simpson Strong-Tie Co., Inc.
 - 3. USP Structural Connectors.
 - 4. Or Equal.
- B. Allowable design loads, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- D. 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 coating designation; and not less than 0.036 inch thick.
 - 1. Use for wood-preservative-treated lumber and where indicated.
- E. Stainless-Steel Sheet: ASTM A 666, Type 316.
 - 1. Use for exterior locations and where indicated.

PART 3 - EXECUTION**3.1 INSTALLATION, GENERAL**

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking and similar supports to comply with requirements for attaching other construction.
- B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- C. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. 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 o.c.
- F. 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 o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
 - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- G. 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.

- H. Comply with AWP A 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.
- I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.10.2, "Fastening Schedule," in the California Building Code (CBC).
 - 2. ICC-ES evaluation report for fastener.
- J. 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.
- K. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 - 1. Comply with indicated fastener patterns where applicable.
 - 2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

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.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions and for load-bearing partitions where framing members bearing on partition are located directly over studs. Fasten plates to supporting construction unless otherwise indicated.

1. For exterior walls, provide 2-by-6-inch nominal or as indicated size wood studs spaced 24 inches o.c. unless otherwise indicated.
 2. For interior partitions and walls, provide as indicated size and o.c. dimension as indicated.
 3. Provide continuous horizontal blocking at mid-height of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
- B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
1. For non-load-bearing partitions, provide double-jamb studs and headers at all openings, sized not less than as follows:
 - a. 4-inch nominal depth for openings 48 inches and less in width
 - b. 6-inch nominal depth for openings 48 to 72 inches in width
 - c. 8-inch nominal depth for openings 72 to 120 inches in width
 - d. 10-inch nominal depth for openings 10 to 12 feet in width.
 2. For load-bearing walls, provide double-jamb studs and headers at all openings, sized not less than as follows:
 - a. 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated.
 3. For load-bearing walls, provide triple-jamb studs and headers at all openings wider than 60 inches.

END OF SECTION 06 10 00

**SECTION 06 16 00
SHEATHING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:

- 1. Wall sheathing.
- 2. Roof sheathing.

- B. Related Requirements:

- 1. Section 06 10 00 "Rough Carpentry"
- 2. Section 06 20 13 "Exterior Finish Carpentry"
- 3. Section 06 20 23 "Interior Finish Carpentry" for plywood utility shelving.
- 4. Structural Drawing Sht.S1.1; Wood Note #3. APA rated Sheathing

1.3 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 plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated plywood.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
 - 2. Fire-Resistant Plywood to be used for mounting in electrical panel locations.

2.2 WOOD PANEL PRODUCTS

- A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- B. Factory mark panels to indicate compliance with applicable standard.
- C. Wood Structural Panels, when used structurally (including for siding, roof and wall sheathing, subflooring, diaphragms, and built-up members), shall conform to the requirements for their type in DOC PS1, DOC PS2, or ANSI / APA PRP210. Each panel or member shall be identified for grade, bond classification, and performance category by the trademarks of an approved testing and grading agency.

2.3 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWPAC 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.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Pressure treat above ground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. After treatment, kiln-dry plywood to a maximum moisture content of 15 percent.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 1. Use treatment that does not promote corrosion of metal fasteners.
 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201/D 3201M at 92 percent relative humidity. Use where exterior type is not indicated.
 3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat plywood for mounting electrical panels and as indicated on Drawings.

2.5 WALL SHEATHING

- A. Plywood Sheathing: Exterior, Structural I sheathing.
 1. Span Rating: Not less than 24 inch o.c. .

2. Nominal Thickness: Not less than 3/8-inch (Building B)

2.6 ROOF SHEATHING

- A. Plywood Sheathing: Exterior, Structural I sheathing.
 1. Span Rating: Not less than as indicated.
 2. Nominal Thickness: Not less than 15/32-inch.(Building B)

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Sheathing to Wood Framing: ASTM C 1002.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 1. Table 2304.10.2, "Fastening Schedule," in the California Building Code.
- D. Use common wire 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. Install fasteners without splitting wood.

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- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall and roof sheathing panels.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8-inch apart at edges and ends.

END OF SECTION 06 16 00

SECTION 06 20 13
EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior standing and running wood trim.
 - 2. **Lumber Plywood** siding.
 - 3. **[Plywood] [Lumber]** soffits.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for framing exposed to view.
 - 2. Section 09 91 13 "Exterior Painting" for finish painting of exterior finish carpentry.
 - 3. Section 09 93 00 "Staining and Transparent Finishing" for finish staining of exterior finish carpentry.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors 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. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
- B. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

C. Samples for Verification:

1. For each species and cut of lumber and panel products, with 1/2 of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.

1.4 INFORMATIONAL SUBMITTALS

A. Compliance Certificates:

1. For lumber that is not marked with grade stamp.
2. For preservative-treated wood that is not marked with treatment-quality mark.

B. Valuation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.7 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
1. Indications that materials are wet or moisture damaged include discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS**2.1 MATERIALS, GENERAL**

- A. Lumber: DOC PS 20 and the following grading rules:
 - 1. RIS: Redwood Inspection Service, "Standard Specifications for Grades of California Redwood Lumber."
 - 2. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
 - 3. WWPA: Western Wood Products Association, "Western Lumber Grading Rules."
- B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - 1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.
- C. Softwood Plywood: DOC PS 1.
 - 1. Application: Where indicated

2.2 EXTERIOR TRIM (Match existing)

- A. Lumber Trim for Painted Finish:
 - 1. Species and Grade: Western red cedar, Grade B; WCLIB, or WWPA. or Hem-fir, Prime or D finish; NLGA, WCLIB, or WWPA
 - 2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
 - 3. Finger Jointing: Not allowed
 - 4. Face Surface: smooth.
 - 5. Factory Priming: Factory coated on faces and edges with exterior primer compatible with topcoats specified.
- B. Moldings for Painted Finish: MMPA WM 4, P-grade wood moldings. Made from kiln-dried stock to patterns included in MMPA's "WM/Series Wood Molding Patterns".
 - 1. Species: Western red cedar, Eastern white, Idaho white, lodgepole,
 - 2. Finger Jointing: Not allowed .
 - 3. Factory Priming: Factory coated on faces and edges with exterior primer compatible with topcoats specified.

2.3 PLYWOOD SIDING

- A. Plywood Type: APA-rated siding

- B. Thickness: As indicated.
- C. Face Species: Western red cedar.
- D. Pattern: Plain - to match existing panels around windows
- E. Surface: Smooth

2.4 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.
 - 1. Provide stainless-steel fasteners for exterior trim and finish work .
- B. Flashing: Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.
 - 1. Horizontal Joint Flashing for Panel Siding: Preformed, galvanized-steel, Z-shaped flashing.
- C. Sealants: Latex, complying with ASTM C 834 Type OP, Grade NF and with applicable requirements in Section 07 92 00 "Joint Sealants," recommended by sealant manufacturer and manufacturer of substrates for intended application.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation-Construction Systems.
 - b. Pecora Corporation.
 - c. Tremco, Inc.
 - d. Or Equal.

2.5 FABRICATION

- A. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.
- 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.
- 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. Prime and backprime lumber and moldings to be painted, including both faces and edges, unless factory primed. Cut to required lengths and prime ends. Comply with requirements in Section 09 91 13 "Exterior Painting."

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Install to tolerance of 1/8-inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 3. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install flat-grain lumber with bark side exposed to weather.
- B. Match color and grain pattern across joints.
- C. Install trim 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.

1. Use scarf joints for end-to-end joints.
 2. Stagger end joints in adjacent and related members.
- D. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
- E. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.5 ADJUSTING

- A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior 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 exterior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

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 discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 13

SECTION 06 20 23
INTERIOR FINISH CARPENTRY

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior trim, including non-fire-rated doors and sidelight frames.
 - 2. Interior paneling (at .
 - 3. Shelving[and clothes rods.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for finishes exposed to view.
 - 2. Section 09 91 23 "Interior Painting" for priming and backpriming of interior finish carpentry.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
- B. Samples for Verification:
 - 1. For each species and cut of lumber and panel products with non-factory-applied finish, with 1/2 of exposed surface finished, 50 sq. in. for lumber and 8-by-10 inches for panels.
 - 2. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. for lumber and 8-by-10 inches for panels.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof

sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

- B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and the applicable rules of grading indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's Board of Review. Grade lumber by an agency certified by the American Lumber Standard Committee's Board of Review to inspect and grade lumber under the rules indicated.
 - 1. NHLA: National Hardwood Lumber Association, "Rules for the Measurement and Inspection of Hardwood & Cypress."
 - 2. RIS: Redwood Inspection Service.
 - 3. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
 - 4. WWPA: Western Wood Products Association, "Western Lumber Grading Rules."
- B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - 1. For exposed lumber, mark grade stamp on end or back of each piece.
- C. Softwood Plywood: DOC PS 1.

2.2 INTERIOR TRIM (Match original trim)

- A. Lumber Trim for Opaque Finish (Painted Finish):
 - 1. Species and Grade: Douglas fir-larch or Douglas fir south, Prime or D finish; WCLIB, or WWPA.
 - 2. Maximum Moisture Content: 15 percent[with at least 85 percent of shipment at 12 percent or less].
 - 3. Face Surface: Surfaced (smooth).
- B. Moldings for Opaque Finish (Painted Finish): Made to patterns included in MMPA "WM/Series Wood Molding Patterns"..
 - 1. Hardwood Moldings: MMPA HWM 4, P-grade.
 - a. Species: Aspen, basswood, cottonwood or yellow poplar .
 - b. Maximum Moisture Content: 9 percent.
 - 2. Finger Jointing: Not allowed.
- C. Wood Molding Patterns: Provide moldings made to match original trim.

2.3 PANELING

- A. Hardwood Veneer Plywood Paneling: Manufacturer's stock hardwood plywood panels complying with HPVA HP-1.
 - 1. Face Veneer Species and Cut: **[Rotary-cut white birch] [Plain-sliced red oak]**.
 - 2. Veneer Matching: **[Random match] [Selected for similar color and grain]**.
 - 3. Backing Veneer Species: Any hardwood compatible with face species.
 - 4. Construction: Veneer core.
 - 5. Thickness: **[1/8-inch] [5/32-inch] [5-mm] [1/4-inch] [5/16-inch] [7/16-inch]**.
 - 6. Panel Size: **[48-by-96 inches] [48-by-120 inches]**.
 - 7. Glue Bond: Type II (interior).
 - 8. Face Pattern: Manufacturer's standard pattern of V-grooves, with grooves at edges, center, and third points of panels, and at other locations to provide pattern resembling random-width boards.
 - 9. Finish: As selected by Architect from manufacturer's full range.
- B. Softwood Board Paneling: Interior wood-board paneling complying with MMPA WM 9.
 - 1. Species: **[Western red cedar] [Western Hemlock] [Douglas Fir]**.
 - 2. Grade: **[Clear No. 1] [Clear No. 2]**.
 - 3. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
 - 4. Pattern: As indicated.
 - 5. Grain: Vertical grain.
 - 6. Length: Uniform lengths of dimension indicated or required to provide full-length pieces without intermediate end joints.

7. Finish: Manufacturer's standard sanded finish, ready for field application of transparent finish.
8. Net Coverage Width: Not less than **[5-1/16 inches] [6-3/4 inches] [8-3/4 inches]**.

2.4 SHELVING AND CLOTHES RODS

- A. Closet Shelving: Made from the following materials, 3/4-inch thick.
 1. Softwood Boards: Douglas fir-larch, Douglas fir south, or hem-fir; C & Btr Prime finish; WCLIB, or WWPA;
- B. Shelf Cleats: 3/4-by-5-1/2-inch boards with hole and notch to receive clothes rods, as specified above for shelving lumber trim for opaque finish
- C. Clothes Rods: 1-1/2-inch diameter clear, kiln-dried Douglas fir or southern pine.

2.5 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
- C. Paneling Adhesive: Comply with paneling manufacturer's written recommendations for adhesives.
- D. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.

2.6 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.
 2. Wood-board paneling.
- 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.
- 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.

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. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
2. Install trim after gypsum-board joint finishing operations are completed.
3. 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 PANELING INSTALLATION

- A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings. Install with uniform tight joints between panels.
1. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners. Space fasteners and adhesive as recommended by panel manufacturer.
 2. Conceal fasteners to greatest practical extent.
 3. Arrange panels with grooves and joints over supports. Fasten to supports with nails of type and at spacing recommended by panel manufacturer. Use fasteners with prefinished heads matching groove color.
- B. Board Paneling: Install according to manufacturer's written instructions. Arrange in random-width pattern suggested by manufacturer unless boards or planks are of uniform width.
1. Install in full lengths without end joints.
 2. Select and arrange boards on each wall to minimize noticeable variations in grain character and color between adjacent boards. Install with uniform tight joints between boards.
 3. Fasten paneling by face nailing, setting nails, and filling over nail heads.
 4. Fasten paneling with trim screws, set below face and filled.
 5. Fasten paneling by blind nailing through tongues.
 6. Fasten paneling with paneling system manufacturer's concealed clips.
 7. Fasten paneling to gypsum wallboard with panel adhesive.

3.6 SHELVING AND CLOTHES ROD INSTALLATION

- A. Cut shelf cleats at ends of shelves about 1/2-inch less than width of shelves and sand exposed ends smooth.
- B. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled. Space fasteners not more than 16 inches o.c. Use 2

fasteners at each framing member or fastener location for cleats 4 inches nominal in width and wider.]

1. Apply a bead of multipurpose construction adhesive to back of shelf cleats before installing. Remove adhesive that is squeezed out after fastening shelf cleats in place.
- C. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches o.c. Fasten to framing members, blocking, or metal backing.
- D. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners not more than 12 inches o.c.
- E. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. and within 6 inches of end of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- F. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.
 1. Fasten shelves to cleats with finish nails or trim screws, set flush.
 2. Fasten shelves to brackets to comply with bracket manufacturer's written instructions.
- G. Install rod flanges for rods as indicated. Fasten to shelf cleats, framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Install rods in rod flanges.

3.7 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.

3.8 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes, if any.

3.9 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.

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- 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 discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 23

SECTION 06 41 16
PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Plastic-laminate-faced architectural cabinets.
 - 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets that are not concealed within other construction.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
 - 2. Section 12 36 61 "Solid Surfacing"

1.3 DEFINITIONS

- A. AWS: "Architectural Woodwork Standards", adopted and published jointly by AWI, AWMAC, and WI.

1.4 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.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 08 71 00 "Door Hardware" to fabricator of architectural cabinets; coordinate Shop Drawings and fabrication with hardware requirements.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site a minimum of two weeks before the start of Work for this Section. Discussion items will include but not be limited to the following:
 - 1. Time and schedule
 - 2. Status of availability of products for complete installation
 - 3. Status of available manpower for complete installation
 - 4. Coordination of related trades
 - 5. Confirmation of casework dimensions

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other related components.
 - 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 2. Show locations and sizes of cutouts and holes for electrical switches and outlets voice and data items installed in architectural plastic-laminate cabinets.
 - 3. Apply WI Certified Compliance Program label to Shop Drawings.
- C. Samples for Initial Selection: For each type of exposed finish.
- D. Samples for Verification:
 - 1. Plastic laminates, 12-by-12 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. Wood-grain plastic laminates, 12-by-24 inches, for each type, pattern and surface finish, with one sample applied to core material and specified edge material applied to one edge.
 - 3. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
 - b. Miter joints for standing trim.
 - 4. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Fabricator/Installer.

- B. Product Certificates: For the following:
 - 1. Composite wood and agrifiber products.
 - 2. High-pressure decorative laminate.
 - 3. Glass.
 - 4. Adhesives.
- C. Woodwork Quality Standard Compliance Certificates: WI Certified Compliance Program.
- D. At Substantial Completion, provide WI Certificate of Compliance for all casework and materials installed.

1.8 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) 2022 edition
 - 1. Operable parts for all accessible casework shall comply with CBC Section 11B-309.
- B. Composite wood products
 - 1. 5.504.4.5 Composite wood products, hardwood plywood, particleboard, and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure (ATCM) for Composite Wood (17 CCR 93120 et.seq.) Those materials not exempted by the ATCM must meet the specified emission limits as shown in Table 5.504.4.5.

1.9 QUALITY ASSURANCE

- A. Work shall be done in accordance with AWS for the grades specified.
- B. Fabricator/Installer Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a five year record of successful in-service performance. WI compliance certification is required. WI will inspect work and provide certification for work that passes inspection if fabricator is not certified/licensed.
- C. Submit installers/Fabricators Woodwork Institute Accredited Millwork Company Certificate. (AMC)
- D. Certified Compliance:
 - 1. Provide a WI Certificate of Compliance indicating that all casework meets the requirements of the AWS, the plans and specifications.
 - 2. Apply a WI Certificate of Compliance Label to each section of casework.
 - 3. On completion of installation, provide a WI Certified Compliance Certificate for the installation.

4. All WI Certified Compliance fees are the responsibility of the casework manufacturer.
 5. Accredited Millwork Companies (AMCs) that have met all the requirements can self-certify Certified Compliance projects only. AMC's shall self-certify that the installation is built and installed to the North American Architectural Woodwork Standards or Contractor shall attain WI Inspection and Certification.
- E. A single manufacturer shall provide and install the work described in this Section.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that might damage architectural cabinets have been completed in installation areas. Store cabinets only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.11 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 between 60 and 90 deg. F and relative humidity between 17 and 50 percent 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 or concealed by construction, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of cabinets indicated for construction, finishes, installation, and other requirements.

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1. Provide labels and certificates from WI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
- B. Grade: Custom with exceptions noted herein.
- C. Type of Construction: Style A, Frameless.
- D. Door and Drawer Front Style: Flush overlay.
- E. Reveal Dimension: 1/8 inch.
- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Formica Corporation.(Basis of Design)
 - b. Nevamar Company, LLC; Decorative Products Div.
 - c. Wilsonart LLC.
 - d. Or Equal.
- G. Core Material at Cabinet Body
 1. Exterior veneer core plywood.
 2. Particleboard is not permitted for use as core material.
- H. Laminate Cladding for Exposed Surfaces:
 1. Horizontal Surfaces: Grade HGS.
 2. Vertical Surfaces: Grade VGS.
 3. Edges: PVC edge banding, 3mm thick; 1mm thick PVC edge banding on case bodies. All edge banding shall be machine applied. Edge banding at outside edges shall be "eased" to eliminate sharp edges. Submit manufacturers standard edge banding colors for Architect's selection including those matching laminate in color, pattern and finish.
 4. Pattern Direction: Vertically for doors and fixed panels, vertically for drawer fronts.
- I. Materials for Semiexposed Surfaces:
 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
 - a. Edges of Plastic-Laminate Shelves: Grade VGS, matching laminate in color, pattern, and finish.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade CLS.

2. Drawer Sides and Backs: Solid-hardwood lumber.
 3. Drawer Bottoms: Hardwood plywood.
- J. Dust Panels: 1/4-inch plywood above compartments and drawers unless located directly under tops.
- K. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- L. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
- M. Colors, Patterns, and Finishes: Plastic Laminate Basis of Design is indicated on the Drawings. Provide as indicated in the Finish Schedule. :
- N. Plastic-Laminate Shelves:
1. Plastic-Laminate Shelves: Plastic laminate shop bonded to both faces and all edges of 1-inch-thick core. Sand surfaces to which plastic laminate is to be bonded.
 - a. Shelf Core: Exterior plywood. Comply with CHPS requirements.
 - b. Plastic-Laminate Grade for Shelves: HGL.
- O. Backsplash detail: Provide as indicated.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
 2. Wood Moisture Content: 4 to 9 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
1. Softwood Plywood: DOC PS 1.
 2. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.
 3. Core Material at Cabinet Body
 - a. Exterior veneer core plywood.
 - b. Particleboard is not permitted for use as core material.

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2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with WI grade architectural cabinets.
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, Grade 2, B01602, 120 degrees of opening, self-closing. ISO 9001 certified manufacture.
- C. Wire Pulls: Back mounted, brushed stainless steel, 4 inches long, 5/16-inch in diameter.
- D. Adjustable Shelf Standards and Supports: BHMA A156.9, B84071; with shelf rests, B84081.
 - 1. Shelf Standards: To be finished flush with wall or cabinet by constructing dado cuts.
- E. Drawer Slides: BHMA A156.9. Rated for the following loads:
 - 1. Box Drawer Slides: 100 lb/f. (Grade 1HD-100).
 - 2. File Drawer Slides: 200 lb/f. (Grade 1HD-200).
 - 3. Pencil Drawer Slides: 45 lb/f. (Grade 1).
 - 4. Keyboard Slides: 100 lb/f. (Grade 1HD-100).
 - 5. Grade 1: Side mounted; full-extension type; zinc-plated steel with polymer rollers.
 - 6. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 - 7. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
 - 8. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
 - 9. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
 - 10. For computer keyboard shelves, provide Grade 1HD-100.
- F. Door Locks: BHMA A156.11, E07121.
 - 1. Finishes: BHMA 654, Satin Stainless Steel.
- G. Lock Keys:
 - 1. Key all casework to one keyway.
 - 2. Provide three keys for each room with casework.
- H. Drawer Locks: BHMA A156.11, E07041.
 - 1. Finishes: BHMA 654, Satin Stainless Steel.
- I. Door and Drawer Silencers: BHMA A156.16, L03011.

- J. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, 6-mm thick unless otherwise indicated.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 - 2. Satin Stainless Steel: BHMA 630.
- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

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. Adhesive for Bonding Plastic Laminate: Contact cement or PVA.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

- A. Fabrication shall comply with AWS requirements.
- B. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- C. Complete fabrication, including assembly, finishing 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.
 - 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or

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roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

- E. Install glass to comply with applicable requirements in Section 08 80 00 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas for not less than 72 hours.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required. Remove packing materials.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Install casework in conformance with the latest edition of the AWS.
- C. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- D. Install cabinets level, plumb, true, and straight. Shim as required with 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 finish at cuts.
- F. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with cabinet surface.
 - 1. Use filler matching finish of items being installed.
- G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8-inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets to walls as indicated on Drawings.

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3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 06 41 16

**SECTION 07 21 00
THERMAL INSULATION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber blanket.
 - 2. Glass-fiber board.
- B. Related Requirements:
 - 1. Section 06 16 00 "Sheathing"
 - 2. Section 09 24 00 "Cement Plastering"

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.5 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.

PART 2 - PRODUCTS**2.1 GLASS-FIBER BLANKET**

- A. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Owens Corning.
 - d. Or Equal.

2.2 GLASS-FIBER BOARD

- A. Glass-Fiber Board, Unfaced: ASTM C 612, Type IA; unfaced, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84, passing ASTM E 136 for combustion characteristics. Nominal density of 2.25 lb/cu. ft, thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Owens Corning.
 - d. Or Equal.

2.3 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGM Industries, Inc.
 - b. Cal-Fasteners, Inc.
 - c. Integrity Fasteners, Inc.
 - d. Or Equal.
 - 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030-inch thick by 2 inches square.

- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. AGM Industries, Inc.
 - b. Cal-Fasteners, Inc.
 - c. Integrity Fasteners, Inc.
 - d. Or Equal.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGM Industries, Inc.
 - b. Cal-Fasteners, Inc.
 - c. Gemco.
 - d. Or Equal.

2.4 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

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.
- 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. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. 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. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 - 5. 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.
 - 6. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
- B. 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. 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 07 21 00

**SECTION 07 25 00
WEATHER BARRIERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and provisions of the Contract including General and Supplementary Conditions and other Division - 01 Specification Sections apply to this section as if repeated herein.

1.02 SUMMARY

- A. Section Includes the following:
 - 1. Materials and installation methods for self-adhered vapor permeable air barrier membrane system located in the non-accessible part of the wall.
 - 2. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.
- B. Related Sections:
 - 1. Section 03 30 00 – Cast-In-Place Concrete
 - 2. Section 05 40 00 – Cold Formed Metal Framing; to support plaster finish.
 - 3. Section 06 16 43 – Gypsum Sheathing
 - 4. Section 07 46 46 – Fiber Cement Siding
 - 5. Section 07 62 00 – Sheet Metal Flashing and Trim; Drips at doors and windows
 - 6. Section 08 41 13 – Aluminum Framed Entrances and Storefronts
 - 7. Section 09 24 00 – Cement Plaster, weather barriers underneath

1.03 PERFORMANCE REQUIREMENTS

- A. General: Weather barrier (same as "Air Barrier") shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. The building envelope shall be constructed with a continuous air barrier to control air leakage into, or out of the conditioned space. The air barrier shall have the following characteristics:
1. It must be continuous, with all joints made airtight.
 2. It shall have an air permeability not to exceed 0.004 cfm/sq.ft. under a pressure differential of 0.3 in. water. (1.57 psf) (equal to [0.02L/sq.m@75Pa](#)), when tested in accordance with ASTM E2178.
 3. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelop without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
 4. It shall be durable or maintainable.
 5. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
 - a. Foundation and walls
 - b. Walls and windows or doors
 - c. Different wall systems
 - d. Wall and roof
 - e. Wall and roof over unconditioned space
 - f. Walls, floor and roof across construction, control and expansion joints.
 - g. Walls, floors and roof to utility, pipe and duct penetrations.
 6. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

1.04 REFERENCE STANDARDS

- A. ASTM International
 1. ASTM C920; Standard Specification for Elastomeric Joint Sealants
 2. ASTM D412; Standard Test Methods for Rubber Properties in Tension
 3. ASTM D570: Test Method for Water Absorption of Plastics
 4. ASTM D903; Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
 5. ASTM D1004; Test Method for Initial Tear Resistance of Plastic Film and Sheeting
 6. ASTM D1876: Test Method for Peel Resistance of Adhesives
 7. ASTM D1938: Test Method for Tear Propagation Resistance of Plastic Film and Sheeting.
 8. ASTM D1970: Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 9. ASTM D4263: Test Method for Indicating Moisture in Concrete by the Plastic sheet Method.
 10. ASTM D4541: Test Method for Pull-off Strength os Coatings Using Portable Adhesion Testers
 11. ASTM D5034 Test Method for Breaking Strength and Elongation of Textile fabrics
 12. ASTM E96: Test Method for Water Vapor Transmission of Materials
 13. ASTM E154: Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs, on Walls or as Ground Cover.
 14. ASTM E1186: Practice for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems
 15. ASTM E2178; Test Method for Air Permeance of Building Materials
 16. ASTM E2357: Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
 17. ICC AC 308: Water Resistance: AC 308; Acceptance Criteria for Water-Resistive Barriers
- B. California Building Code (CBC) 2019
- C. Conform to California Air Resources Board (CARB) Rules, especially South Coast AQMD Rule 1113.

- D. Conform to Title 19, California Code of Regulations (CCR), Public Safety, State Fire Marshal Regulations

1.05 SUBMITTALS

- A. Refer to Section 01 33 00 Submittal Procedures.
- B. Product Data: Submit manufacturer current technical literature for each system component.
- C. Samples: Submit representative samples of the following for approval:
 - 1. Self-Adhered Air Barrier Membrane
 - 2. Self-Adhered Transition Membrane
 - 3. Self-Adhered Through Wall Flashing
- D. Submittals
 - 1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
 - 2. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks counterflashing strip, penetrations, inside and outside corners, terminations and tie-ins with adjoining construction including drift and expansion joints.
 - a. Include details of interfaces with other materials that form part of air barrier.
 - b. Include details of mockups
 - 2. Manufacturer Instructions: Provide manufacturer's written installation instructions.
 - 3. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with project materials that connect to or that come in contact with the barrier; signed by product manufacturer.
 - 4. Qualification Data: For Applicator
 - 5. Product Test Reports; Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified for ASTM E2178
 - 6. Weather Barrier Warranty: Submit Manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

1.06 REGULATORY REQUIREMENTS

- A. Comply with California Building Code 2022 (CBC).
- B. Conform to California Air Resources Board (CARB) Ruled, especially, South Coast AQMD rule 1113.
- C. Conform to Title 19. California Code of Regulations (CCR), Public Safety, State Fire Marshal regulations

1.07 QUALITY ASSURANCE

- A. Applicator Qualifications
 - 1. Engage experienced personnel to perform work of this Section. Any Contractor's Representative used for this portion of the Work shall have completed work similar in material, design, and extent to that indicated for this project with a record of successful in-service performance, for a period of at least 5 years.
 - 2. Installation shall be in accordance with manufacturer's installation guidelines and recommendations.
 - 3. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.
- B. Manufacturer Qualifications
 - 1. Air barrier systems shall be manufactured and marketed by a firm with a minimum of 20 years' experience in the production and sales of waterproofing and air barriers. Manufacturers proposed for use , but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.
- C. Source Limitations: Obtain primary air-barrier material and through wall flashing through one source from a single manufacturer. Should project require a vapor permeable and vapor impermeable air barrier on same project, obtain vapor-permeable and vapor impermeable air barrier and through wall flashing from one source from a single manufacturer.
- D. Mockups: Before beginning installation of air barrier, provide minimum 100 sq.ft. mockup incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, sealing of gaps, terminations, and penetrations of air barrier membrane. The mockup, when approved by the Owner and Architect, will be used for comparison with the remainder of the Work described in this Section for the purpose of acceptance or rejection.
 - 1. Coordinate construction of mockup to permit inspection by District's testing agency of air barrier before external insulation and cladding is installed.

2. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
3. Contact manufacturer's designated representative prior to weather barrier assembly installation, to perform required mock-up visual inspection and analysis as required for warranty.

- E. Pre-Installation Conference: A pre-installation conference shall be held a minimum of two weeks before work in this Section commences. Establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

Pre-installation conference shall include the Contractor, installer, Architect, Inspector and system manufacturer's field representative. Agenda for meeting shall include but not be limited to the following:

1. Review of submittals.
2. Review of surface preparation, minimum curing period and installation procedures.
3. Review of special details and flashings.
4. Sequence of construction, responsibilities and schedule for subsequent operations.
5. Review of mock-up requirements
6. Review of inspection, testing (including adhesion and water testing) protection and repair procedures.
7. Review all related project requirements and status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and Safety Data Sheets (SDS). Protect from damage from sunlight, weather, excessive, temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
- B. Do not double-stack pallets of fluid applied components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
- C. Protect fluid-applied components from freezing and extreme heat.

- D. Sequence deliveries to avoid delays, but minimize on-site storage. Include date stamps for products and ensure products are installed before shelf life dates.

1.09 SCHEDULING

- A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers, flashings and roofing to provide a weather-tight barrier assembly.
- B. Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer.
- C. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damaged, soiled, wet substrate or during rain, fog or mist.

1.10 WARRANTY

- A. Submit manufacturer's material warranty that air barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.
- B. Special Warranty
 - 1. Weather barrier manufacturer's warranty for weather barrier and labor for a period of ten (10) years from date of purchase.
 - 2. Pre-installation meetings and jobsite observations by weather barrier manufacturer for warranty is required prior to assembly installation.

PART 2 - PRODUCTS**2.01 Manufacturers**

- A. GCP, Applied Technologies (Perm-A-Barrier VPS) Basis of Design
- B. Or Equal

2.02 MEMBRANE

- A. (Basis of Design) Perm-A-Barrier VPS to be used with 2 layers of 60-minute Grade D Building paper slip sheet under exterior plaster and fiber cement board. (Or Equal)
- B. Self-Adhered Air Barrier Membrane: Perm-A-Barrier VPS manufactured by GCP Applied Technologies, 62 Whittemore Avenue, Cambridge, MA; a self-adhered membrane consisting of a breathable carrier film with a specially designed adhesive, which permits the transfusion of water vapor and provides superior protection against the damaging effects of air and water ingress on building structures. Product shall have the following minimum physical properties:

1. Air Permeance, ASTM E2178: Not to exceed 0.004 cfm/sq.ft. under a pressure differential of 0.3 in. water. (1.57 psf) (equal to 0.02L/sq.m @ 75 Pa)
 2. Assembly Air Permeance, ASTM E2357: Not to exceed 0.04 cfm/sq.ft. under a pressure differential of 0.3 in water (1.57 psf)
 3. Water Vapor Permeance, ASTM E96: not less than 10 perms
 4. Water Resistance, ICC AC 308; Pass
 5. Breaking Force, ASTM D5034: >40lbf MD, and >35 lbf CD
 6. Pull Adhesion at min. temperature: ASTM D4541: min. 15 psi to primed glass faced gypsum sheathing, min. 12 psi to primed CMU.
 7. Peel Adhesion at min. temperature: ASTM D903: min. 5 pli to primed glass faced gypsum sheathing, min. 4 pli to PERM-A-Barrier VPS, min. 2.5 pli to primed CMU
 8. UV Exposure Limit: Not more than 60 Calendar days
 9. Water Penetration Resistance around Nails: ASTM D1970 Modified: Pass
 10. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly
- C. Transition Membrane: Perm-A-Barrier Detail Membrane manufactured by GCP Applied Technologies: a 36 mil (0.9mm) of self-adhesive rubberized asphalt integrally bonded to 4 mil (0.1mm) of cross-laminated, high density polyethylene film to provide a min. 40 mil (1.0 mm) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming to the following:
1. Water Vapor Transmission: ASTM E96, Method B: 2.9 ng/m²sPa (0.05 perms) max.
 2. Air Permeance at 75Pa (0.3 in. water) pressure difference: 0.0006 L/(s.m²)(0.00012 cfm/ft²) max.
 3. Puncture Resistance, ASTM E154: 178 N (40lbs.) min.
 4. Lap Adhesion at -4degrees C (25 degrees F), ASTM D1876: 880 N/m (5.0 lbs./in.) of width
 5. Low Temperature Flexibility, ASTM D1970: Unaffected to -43 degrees C (-45 degrees F)
 6. Tensile Strength, ASTM D412, Die C Modified: min. 2.7 MPa (400 psi)
 7. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D412, Die C: min. 200%

- D. Transition Membrane Aluminum Membrane: Perm-A-Barrier Aluminum Flashing manufactured by GCP Applied Technologies; a 35 mil (0.9mm) of self-adhesive rubberized asphalt integrally bonded to 5 mil (0.1mm) of aluminum film to provide a min. 40 mil (1.0mm) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming to the following:
1. Water Absorption, ASTM D570: max 0.1% by weight.
 2. Puncture Resistance, ASTM E154: 355N (80lbs) min.
 3. Lap Adhesion at -4 degrees C (25 degrees F), ASTM D1876 Modified: 880 N/m (5.0 lbs.in.) of weight.
 4. Low Temperature Flexibility, ASTM D1970 Modified: unaffected to -26 degrees C (-15 degrees F).
 5. Tensile Strength, ASTM D412, Die C Modified: min. 4.1 MPA (600 Psi)
 6. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C Modified: min.200%
- E. Flexible Membrane Through-Wall Flashing: Perm-A-Barrier Wall Flashing Manufactured by GCP Applied Technologies; a 32 mil (0.8 mm) of self-adhesive rubberized asphalt integrally bonded to 8 mil (0.2mm) of cross-laminated, high-density polyethylene film to provide a min. 40 mil (1.0mm) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming to the following:
1. Water Vapor Transmission, ASTM E96, Method B: 2.9 ng/m²s Pa (0.05 perms) max
 2. Water Absorption, ASTM D570: max.0.1% by weight
 3. Puncture Resistance, ASTM E154: 356 N (80lbs) min.
 4. Tear Resistance:
 - a. Initiation, ASTM D1004: min.58 N (13.0 lbs.) M.D.
 - b. Propagation, ASTM D1938: min. 40 N (9.0 lbs.) M.D.
 5. Lap Adhesion at -4 degrees C (25 degrees F) , ASTM D1876: 880 N/m (5.0 lbs./in.) of width
 6. Low Temperature Flexibility, ASTM D1970: Unaffected to -43 degrees C (-45 degrees F)
 7. Tensile Strength, ASTM D412, Die C Modified: min. 5.5 MPa (800 psi)
 8. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D412, Die C: min. 200%

2.03 PRIMERS

- A. Primer for Primary Self-adhered air barrier membrane: Perm-A-Barrier Primer Plus manufactured by GCP Applied Technologies; a water based primer which imparts an aggressive, high tack finish on the treated substrate. Product shall have the following minimum physical properties:
1. Color: Milky White (wet), Clear (dry)
 2. Weight: 8.25 lbs./gal.
 3. Solids Content (by wt.): 53-57%
 4. Solvent Type: Water
 5. VOC Content: Not to exceed 1 g/L
 6. Application Temperature: 4 degrees C (40 degrees F) and above.
- B. Wall Primer for Self-adhered transition membrane and Self-adhered flexible membrane wall flashing: Perma-A-Barrier WB Primer manufactured by GCP Applied Technologies; a Water-based primer which imparts an aggressive, high tack finish on the treated substrate. Product shall have the following minimum physical properties:
1. Flash Point: No flash to boiling point
 2. Solvent Type: Water
 3. VOC Content: Not to exceed 1g/L
 4. Application Temperature: -4 degrees C (25 degrees F) and above
 5. Freezing Point (as packaged): -7 degrees C (21 degrees F)

2.04 PENETRATIONS & TERMINATION SEALANT

- A. Liquid Membrane for Details and Terminations: Bituthene Liquid Membrane manufactured by GCP Applied Technologies; two part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/L max. VOC content.
- B. Substrate Patching Membrane: Bituthene Liquid Membrane a two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/L max. VOC content.
- C. Joint Sealant: Dow 758 Weather Barrier Sealant

PART 3 – EXECUTION**3.01 EXAMINATION**

- A. Verify that substrates and conditions are ready to accept the Work of this section. Notify Inspector or Architect in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.
- B. All surfaces must be sound, dry, clean and free of oil, grease, dirt excess mortar or other contaminants detrimental to the adhesion of the membranes. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints (if applicable) full-flush.
- C. Curing compounds or release agents used in concrete construction must be resin based without oil, wax or pigments.

3.02 SURFACE PREPARATION

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the air barrier assembly.
- B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws in accordance with exterior sheathing manufacturers written instructions.
- C. Masonry substrates: Apply air and vapor barrier over concrete block and brick with smooth trowel-cut mortar joints, struck full and flush. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.
- D. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.
- E. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free and dry substrate for air barrier application.
- F. Remove grease, oil, bitumen, form-release agents, paints, curing compounds and other penetrating contaminants or film-forming coatings from concrete.
- G. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.
- H. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- I. At changes in substrate plane, apply sealant or Bituthene Liquid Membrane at sharp corners and edges to form a smooth transition from one plane to another.

- J. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 INSTALLATION – AIR BARRIER MEMBRANE

- A. Refer to manufacturer's literature for recommendations on installation.
- B. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions and Contract Documents.
- C. Application of Self-Adhered Air Barrier Membrane:
 - 1. Install air barrier to clean, dry surfaces at air and surface temperatures of 4 degrees C (40 degrees F) and above in accordance with manufacturer's recommendations at locations indicated on Construction Documents.
 - 2. Prime substrate to receive air barrier membrane as required per manufacturer's written instructions.
 - 3. Precut pieces of air barrier into easily handled lengths.
 - 4. Remove release liner and position membrane carefully before placing against the surface.
 - 5. Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate.
 - 6. When properly positioned, immediately place against surface by pressing firmly into place. Roll membrane with extension-handled hard neoprene roller immediately after placement.
 - 7. Overlap adjacent pieces 50mm (2in.) and roll seams.
 - 8. Subsequent sheets of membrane applied above shall be positioned immediately below masonry reinforcement or ties. Bottom edge shall be slit to fit around reinforcing wires or ties, and membrane shall overlap the membrane sheet below by 50mm (2 inches). Roll firmly into place.
 - 9. Seal around masonry reinforcing or ties and all penetrations with LM (under) penetration and weather barrier sealant (over) weather barrier and flashing.
 - 10. Coordinate the installation of air barrier with roof installer to ensure continuity of membrane with roof air barrier.
 - 11. At the end of each working day seal top edge of air barrier to substrate with termination sealant.

12. Do not expose air barrier membrane to sunlight for more than 60 days prior to enclosure.
13. Inspect installation prior to enclosing and promptly repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 150 mm (6 inches) in all directions from the perimeter of the affected area. Install patch in a weather lap fashion integrated with other building envelope elements to provide a air and water tight condition.

3.04 TRANSITION MEMBRANE INSTALLATION

- A. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier. Install all transition membrane only after application of air barrier.
- B. Apply primer to substrates to receive transition membrane at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in the same day. Re-prime areas exposed for more than 24 hours.
 1. Prime glass-fiber-surfaced gypsum sheathing not covered with air membrane material with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems storefront systems, exterior louvers, exterior door framing and other construction used in exterior wall openings, using accessory materials.
- D. At end of each working day, seal top edge transition membrane to substrate with weather barrier sealant.
- E. Apply joint sealants forming part of air barrier assembly within sealant manufacturer's recommended application temperature ranges. Consult sealant manufacturer when sealant cannot be applied within these temperature ranges.
- F. Wall openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts and doors. Apply transition membrane so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.
 1. Transition Membrane: Roll firmly immediately after installation to enhance adhesion.
- G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors and miscellaneous penetrations of air barrier membrane with foam sealant per manufacturer's requirements.

- H. Repair punctures, voids, and deficient lapped seams in transition membrane. Slit and flatten fish-mouths and blisters. Patch with transition membrane extending 6 inches (150 mm) beyond repaired areas in strip direction. Install patches in a weather lapped fashion etc.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Inspections: Air Barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 - 1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
 - 2. Continuous structural support of air barrier system has been provided.
 - 3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions and mortar droppings.
 - 4. Site conditions for application temperature and dryness of substrates have been maintained.
 - 5. Maximum exposure time of materials to UV deterioration has not been exceeded.
 - 6. Surfaces have been primed, if applicable.
 - 7. Laps in transition membrane have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges) with no fish-mouths.
 - 8. Weather barrier sealant has been applied on cut edges.
 - 9. Transition membrane has been firmly adhered to substrate.
 - 10. Compatible materials have been used.
 - 11. Transitions at changes in direction and structural support at gaps have been provided.
 - 12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity and continuity of seal.
 - 13. All penetrations have been sealed.
- C. Test: Testing to be performed will be determined by District's testing agency from amount the following tests:
 - 1. Qualitative Testing: Air Barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, smoke pencil with pressurization or depressurization.
- D. Remove and replace deficient air barrier components and retest as specified above.

- E. Conduct adhesion tests for all adhered products like SAM and sealant. Add in adhesion tests to be performed on all applicable substrates i.e. concrete, aluminum, SAM, etc.

3.10 CLEANING AND PROTECTION

- A. Protect air barrier system from damage during application and remainder of construct period, accord to manufacturer's written instructions.
- B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 60 days.
- C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- D. Remove masking materials after installation.

END OF SECTION 07 25 00

SECTION 07 46 46
FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes fiber-cement siding.
- B. Related Sections:
 - 1. Section 02 41 19 "Selective Demolition"
 - 2. Section 06 10 00 "Rough Carpentry"
 - 3. Section 07 25 00 "Weather Barriers"
 - 4. Section 07 62 00 "Sheet Metal Flashing and trim".
 - 5. Section 09 24 00 "Cement Plastering"
 - 6. Section 09 91 13 "Exterior Painting"

1.3 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Meet with District Construction Manager, Architect, panel Installer, panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects panels, including installers of doors, windows, and louvers.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
 - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 - 5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect panels.
 - 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 - 7. Review temporary protection requirements for panel assembly during and after installation.
 - 8. Review of procedures for repair of panels damaged after installation.
 - 9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 3 inches per 12 inches.
- C. Samples: For fiber-cement siding including all related accessories.

1.5 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Product test reports.
- C. Research/evaluation reports.
- D. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.7 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as directed by Construction Manager.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

1.9 REGULATIONS

- 1. Comply with the California Building Code, 2022.

PART 2 - PRODUCTS**2.1 FIBER-CEMENT SIDING**

- A. General: ASTM C1186, Type A, Grade II, fiber-cement board, noncombustible when tested in accordance with ASTM E136; with a flame-spread index of 25 or less when tested in accordance with ASTM E84.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. James Hardie (Basis of Design)
 - 1) Multi-groove Panel Fine Textured.
 - 2) Thickness; 5/16".
 - b. American Fiber Cement Corporation.
 - c. Or Equal.
- B. Labeling: Provide fiber-cement siding that is tested and labeled in accordance with ASTM C1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- C. Nominal Thickness: Not less than 5/16 inch.
- D. Panel Texture: 4-foot-wide x 8-foot-long sheets, smooth finish with lines milled into the panel at 16-inches on center.
 - 1. Groves to be horizontal.
- E. Factory Priming: Manufacturer's standard acrylic primer.

2.2 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
- B. Flashing: Provide galvanized steel flashing complying with Section 07 62 00 "Sheet Metal Flashing and Trim" at window and door heads and where indicated on Drawings.
- C. Fasteners:
 - 1. For fastening to wood, use fasteners called for in the drawings, and as recommended by ICC ESR-1844 test report, fasteners of sufficient length to penetrate a minimum of 1 inch into substrate.
 - 2. For fastening fiber cement, use stainless fasteners.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 - 1. Install fasteners no more than 16-inches on center as indicated on the drawings and per the ICC ESR-1844 test report.
- B. Install joint sealants perimeter of all panels, and as specified in Section 07 92 00 "Joint Sealants" and to produce a weathertight installation.
- C. Install aluminum trim perimeter of all panels.

3.2 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 07 46 46

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Formed low-slope roof sheet metal fabrications for roof penetration repairs.
 - 2. Sheet metal fabrications for wall openings.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry"

1.3 COORDINATION

- A. 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.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leak proof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details, including attachments to other work.
 - 2. Include identification of material, thickness, weight, and finish for each item and location in Project.

3. Include details for forming, including profiles, shapes, seams, and dimensions.
4. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
5. Include details of termination points and assemblies.
6. Include details of roof-penetration flashing.
7. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counter flashings as applicable.
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 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

D. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

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

1.7 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.

1.8 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. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- 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 NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

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. Stainless-Steel Sheet: ASTM A 240/A 240M Type 316, dead soft, fully annealed; with smooth, flat surface.
 - 1. Finish: 2D dull, cold rolled.
- C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation;.
 - 1. Surface: Smooth, flat Retain "Exposed Coil-Coated Finish" Subparagraph below for factory-coil-coated finish.
 - 2. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat,

and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

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.

2.3 UNDERLAYMENT MATERIALS (For Roof Penetrations)

- A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F; and complying with physical requirements of ASTM D 226/D 226M for Type I and Type II felts.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Atlas Roofing Corporation.
 - b. Kirsch Building Products, LLC.
 - c. SDP Advanced Polymer Products Inc.
 - d. Or Equal.
- C. Self-Adhering, High-Temperature Sheet: 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 according to written recommendations of underlayment manufacturer.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle Coatings & Waterproofing Inc.
 - b. Henry Company.
 - c. Owens Corning.
 - d. Or Equal.
 2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
 3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F. or lower.
- D. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS (For Roof Penetrations)

- 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. Fasteners for Stainless-Steel Sheet: Series 300 stainless-steel.
 - 3. Fasteners for Zinc-Coated (Galvanized) 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 B 32, Grade Sn60 with acid flux of type recommended by stainless-steel sheet manufacturer.
 - 2. For Zinc-Coated (Galvanized) Steel: ASTM B 32, with maximum lead content of 0.2 percent.
- 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 polysulfide polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

- A. General: 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. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. 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.
 2. Obtain field measurements for accurate fit before shop fabrication.
 3. 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.
 4. 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. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof and Roof-to-Roof Edge-Flashing (Gravel-Stop): Fabricate from the following materials:
1. Galvanized Steel: 20 gage / 0.0375-inch minimum thick.
- B. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
1. Galvanized Steel: 22 gage / 0.03125-inch minimum thick.
- C. Roof-Penetration Flashing: Fabricate from the following materials:
1. Galvanized Steel: 22 gage / 0.03125-inch minimum thick.

- D. Roof-Drain Flashing: Liquid-applied elastomeric membrane flashing system compatible with roofing system.

1. PermaFlash System as manufactured by Johns Manville.
2. Or Equal

2.7 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend beyond wall openings.. Fabricate from the following materials:

1. Galvanized Steel: 0.028-inch thick.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028-inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

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

3.2 UNDERLAYMENT INSTALLATION

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

- B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

- C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.
- D. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 - 5. Torch cutting of sheet metal flashing and trim is not permitted.
- 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 stainless-steel 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 substrate 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 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: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.

- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant, interlocking folded seam or blind rivets and sealant unless otherwise indicated.
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

- A. General: 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 head, sill, jamb, and similar flashings to extend beyond wall openings.

3.6 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.
- B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.7 ERECTION 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.

3.8 CLEANING AND PROTECTION

- 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.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. 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. Maintain sheet metal flashing and trim in clean condition during construction.
- E. 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.

END OF SECTION 07 62 00

SECTION 07 92 00**JOINT SEALANTS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:

- 1. Nonstaining silicone joint sealants.
 - 2. Urethane joint sealants.
 - 3. Mildew-resistant joint sealants.

- B. Related Requirements:

- 1. Section 07 92 19 "Acoustical Joint Sealants".
 - 2. Section 08 80 00 "Glazing".
 - 3. Section 09 51 13 "Acoustical Panel Ceilings".
 - 4. Section 32 13 73 "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

1.3 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site a minimum of two weeks before Work in this Section commences.

1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

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D. 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- D. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.7 PRECONSTRUCTION TESTING

- A. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, and curing time.
- B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.9 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:

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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.

1.10 REGULATORY REQUIREMENTS

- A. Sealants shall comply with the testing and product requirements of San Diego Air Pollution Control District Rule 67.0 "Architectural Coatings" and Rule 67.21 "Adhesive Material Application Operations".

1.11 WARRANTY

- A. 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: Two years from date of Substantial Completion.
- B. 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: Manufacturer's standard.
- C. 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.

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.

SPECIFICATIONS

NO. 22-0400

- B. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.
- C. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food; provide products that comply with 21 CFR 177.2600.

2.2 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
- B. 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 C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. Pecora Corporation.
 - c. Tremco Incorporated.
 - d. Or Equal.

2.3 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF / Sonneborn Corporation.
 - b. Sika Corporation.
 - c. Tremco Incorporated.
 - d. Or Equal.

2.4 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

SPECIFICATIONS

NO. 22-0400

- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. Pecora Corp.
 - c. Tremco Incorporated.
 - d. Or Equal.

2.5 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), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- 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.

2.6 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 joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, 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. 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. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 - e. Exterior 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 recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written

instructions. 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 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 concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
 - 4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.

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5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 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.

3.5 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.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces
 1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints in exterior insulation and finish systems.
 - c. Joints between panels.
 - d. Perimeter joints between materials listed above and frames of doors windows and louvers.
 - e. Control and expansion joints in ceilings and other overhead surfaces.
 - f. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, nonstaining, Type S, Grade NS, Class 50, Use NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces
 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.

JOINT SEALANTS

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2. Joint Sealant: Silicone, mildew resistant, acid curing, Type S, Grade NS, Class 25, Use NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Tile control and expansion joints.
 - c. Vertical joints on exposed surfaces of walls and partitions.
 - d. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, Type S, Grade NS, Class 25, Use NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00

SECTION 07 92 19
ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes acoustical firestop joint sealants.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants" for silicone, urethane and mildew resistant joint sealants for non-acoustical applications.

1.3 ACTION SUBMITTALS

- A. Product Data: For each acoustical joint sealant.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of acoustical joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Acoustical-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.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of acoustical joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

SPECIFICATION

NO. 22-0400

- B. VOC: 4g/L, complies with the volatile organic compound (VOC) limit requirements set by South Coast Air Quality Management District (SCAQMD) Rule 1168.
- C. Testing and Classification: Meets ASTM C834 Standard Specification for Latex-based Sealing Compounds. Also tested in accordance with ASTM E84 (surface burning characteristics), ASTM E90 (sound tests) and ASTM E1966 (fire resistant joint systems), ASTM E814 (through penetration firestop systems).
- D. Surface-Burning Characteristic: Classified by UL; 0 flame spread; 0 smoke developed
- E. Sample Warranties: For special warranties.

1.5 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish acoustical 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: Manufacturer's standard.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.
- B. Sealant shall comply with the testing and product requirements of San Diego Air Pollution Control District Rule 67.0 "Architectural Coatings" and Rule 67.21 "Adhesive Material Application Operations".

2.2 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Pecora Corporation.
 - b. Tremco Incorporated.
 - c. United States Gypsum Company.
 - d. Or Equal.
2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.
- 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 joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, 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. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. 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 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.
- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 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 acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect acoustical 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 acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 19

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Interior standard steel doors with hollow metal frames -Building B.
 - 2. Exterior standard steel doors and frames – Building B.
- B. Related Requirements:
 - 1. Section 08 14 16 "Flush Wood Doors" for exterior wood doors in hollow metal frames
 - 2. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.
 - 3. Section 09 91 13 "Exterior Painting" for field painting of exterior doors and frames
 - 4. Section 09 91 23 "Interior Painting" for field painting of interior doors and frames.

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 requirements for installation of door hardware, and access control and security systems.
- C. Existing Conditions: Field survey existing doors and frames that are part of the Work. For existing doors and frames to remain and to receive new door hardware, determine compatibility with hardware specified in Section 08 71 00 "Door Hardware." For existing door openings to receive a new door and/or frame, verify dimensions of door opening and frame depth.

1. Submit a list of respective door and frame measurements to the District Construction Manager for review prior to ordering doors and frames.
2. Notify the District Construction Manager of any doors and/or frames found to be unsuitable for reuse, or that will not accept specified door hardware.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site a minimum of two weeks before start of the Work in this Section. Topics for discussion will include but not be limited to the following:
1. Project schedule requirements
 2. Availability of products for timely installation
 3. Contract Documents / Scope of work
 4. Acceptability of substrates
 5. Submittals
 6. RFIs
 7. Questions Clarifications

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, core descriptions, and finishes.
- B. Shop Drawings: Include the following:
1. Elevations of each door type.
 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of each different wall opening condition.
 6. Details of anchorages, joints, field splices, and connections.
 7. Details of accessories.
 8. Details of moldings, removable stops, and glazing.
- C. Samples for Verification:
1. Fabrication: Prepare Samples approximately 12-by-12 inches to demonstrate compliance with requirements for quality of materials and construction:
 - a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.

- b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.
- D. Product Schedule: For hollow-metal work 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.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.
- B. Certification of Label Construction: For labeled doors, certificate from nationally recognized testing agency stating that component construction conforms to UL rating requirements for the label indicated.
- C. Certification of Rated Assembly: For rated assemblies, provide certificate from nationally recognized testing agency that doors provided have been tested for use in assemblies complying with NFPA 80 for fire-protection ratings indicated, based on testing at positive pressure according to UL 10C.
- D. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
- E. Certification of Physical Endurance: For hollow metal doors, certificate from nationally recognized testing agency that doors comply with requirements of SDI 131-10.
- F. Qualification Data: For Manufacturer, Supplier, and Installer.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A member of SDI that supplies doors and frames through a national distribution system. Manufacturers that market materials by a factory direct method are not acceptable.
- B. Supplier Qualifications: Supplier shall be a qualified direct distributor of the manufacturer's products. The Supplier shall have in its regular employment a person who is currently certified by DHI as an Architectural Hardware Consultant (AHC) or a Certified Door Consultant (CDC). The Supplier shall be available at reasonable times throughout the Project for consultation with Contractor, Architect, and District Construction Manager. The Supplier shall be available for in-person on-site consultation within 48 hours of first notice.
- C. Installer Qualifications: Firm with a minimum of five years' experience in the installation of hollow metal doors and frames similar to the type required for this Project.

- D. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.
- E. The District Construction Manager may select not more than two doors at random for dismantling and inspection of internal construction for compliance with Project Specifications. Provide doors, labor, and tools for inspection under the District Project Manager's supervision, at Contractor's expense.
- F. Failure of any hollow metal frame or door to comply with specified requirements shall be grounds to reject the entire shipment of hollow metal doors and frames, as well as to reject the Manufacturer. Items shall be replaced at Contractor's expense, including two additional doors for dismantling and inspection. No extensions of time or additions to the Contract amount will be allowed due to a rejection of material and substitution of the hollow metal Manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use unvented plastic.
- B. Upon delivery to the site, inspect hollow-metal work for damage. Minor damage may be repaired provided refinished items are equal to new work and accepted by the District's Architect. Otherwise, remove and replace damaged items.
- C. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- D. Store hollow-metal work vertically under cover in a dry, secure location 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. If cardboard containers become wet, remove containers and dry contents immediately.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to warrant products against defects in materials and workmanship.
 - 1. Warranty Period: Two year from date of delivery
- B. Warranty Shall Cover the Following:
 - 1. Complete watertight and airtight system installation with specified tolerances.
 - 2. System is structurally sound and free from distortion.
 - 3. Include provision for replacement of failed units..

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ceco Door; ASSA ABLOY.
 2. Curries Company; ASSA ABLOY.
 3. Steelcraft; an Allegion brand.

2.2 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.
1. Physical Performance: SDI A250.4, Level A.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.067-inch, with minimum G90 coating.
 - d. Edge Construction: Model 2, Seamless construction by continuous wire weld.
 - e. Core: Polystyrene.
 3. Frames:
 - a. Materials: Metallic-coated, steel sheet, minimum thickness of 0.067-inch, with minimum G90 coating.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Full profile welded.
 - 1) Welded frames shall be ground smooth flush with neatly mitered or butted material cuts. Re-prime welded areas.
 4. Exposed Finish: Factory Prime.

2.3 EXTERIOR HOLLOW-METAL FRAMES (Doors to be solid core Wood at double exit doors)

- A. Construct hollow-metal frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Refer to Section 08 14 16 "Flush Wood Doors" for Exterior Solid Core Doors
- C. Maximum-Duty Frames:
 - 1. Physical Performance: SDI A250.4, Level A.
 - 2. Materials: Metallic-coated steel sheet, minimum thickness of 0.067-inch, with minimum G90 galvanized coating.
 - 3. Construction: Full profile welded. Welded frames shall be ground smooth flush with neatly mitered or butted material cuts. Re-prime welded areas.
 - 4. Exposed Finish: Prime.

2.4 BORROWED LITES AND HOLLOW-METAL PANELS

- A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
 - 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.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor. Formed from same material as frames, minimum thickness of 0.067-inch. Provide 2 fasteners welded to the bottom of each jamb and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.

2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- A. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- C. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Zcoating 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.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- E. 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.
- F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- H. Glazing: Comply with requirements in Section 08 80 00 "Glazing."
- I. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Vertical Edges for Single-Acting Doors: Bevel edges 1/8-inch in 2 inches. Both hinge edge and lock edge channels to be welded to each face sheet of door.

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- a. Door hinge edge reinforcing shall be one-piece full height 12 gage channel formed and tapped for hinges, or as required per hardware.
 2. Top Edge Closures: Close top edges of doors with flush closures of 16 gage steel welded to face sheets.
 3. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of 16 gage steel welded to face sheets.
 4. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration. Close tops of exterior doors flush by the addition of 16 gage galvanized steel channel fillers sealed watertight.
 5. Astragals: Provide flat security type or 'Z' overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4-inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Fabricate in one piece unless shipping or handling limitations dictate fabrication in sections. Where frames are fabricated in sections, minimize sections, and provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
 2. Welded frame units are to be delivered to job site as single units. Transoms, sidelights, and window walls which are oversized for transportation, shall be furnished with splices and assembled in the field.
 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated. Screws are allowed only on the non-secure side and shall not be visible when viewing door lite frame face.
 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be built into masonry or grouted in full.
 5. 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.
 6. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 24 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.

HOLLOW METAL DOORS AND FRAMES**08 11 13 - 8****DEHESA SCHOOL MODERNIZATION**

- b. Compression Type: Not less than two anchors in each frame.
 - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
- 7. Head Anchors: Two anchors per head for frames installed in metal-stud walls, and three or more anchors in frame widths exceeding 42 inches. Spot weld to each jamb and extend to structure where indicated on Drawings.
- 8. Head Struts: For frames not anchored to masonry or concrete construction, provide ceiling struts spot welded to jambs each side extending to building structure where indicated on Drawings.
- 9. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- 10. Terminated Stops: Terminate stops 6 inches above finish floor with the required degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware: include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with BHMA A156.115 for preparation of hollow-metal work for hardware. Provide minimum thickness hardware reinforcing for mortise or surface applied hardware as follows:
 - a. Hinge doors. 0.138-inch or equivalent number of threads on
 - b. Hinge 0.180-inch on frames for mortise hinges.
 - c. Continuous hinges 0.108-inch full length.
 - d. Locks 0.108-inch or equivalent number of threads.
 - e. Panic Devices 0.108-inch.
 - f. Surface Closer 0.078-inch.
 - g. Hold Open Arm 0.108-inch.
 - h. Closer 0.078-inch channel type.
 - 3. Through-bolts (SNB) are not permitted.
 - 4. Do not include unnecessary cutouts in door faces not required by hardware template.

HOLLOW METAL DOORS AND FRAMES

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- F. Glazed Lites: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Window frame glass stops shall be a minimum 0.0516-inch steel and 5/8-inch in height. Exterior stops and countersunk flat-head screws to be galvanized.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 4. Provide loose stops and moldings on interior (secure side) of hollow-metal work.
 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
- G. Existing Construction:
1. Modify existing doors and frames indicated to receive new hardware and hardware reinforcements.
 2. Template existing frames indicated to receive new doors with lockset latchbolt aligned with existing frame strike.
 3. When new strikes are required in frames with inadequate dimensions, field cut existing strike jambs, remove the existing strikes, and weld strike reinforcement as required. Surface installation is prohibited.
 4. Fill, patch, sand, and repaint doors and frames as required by the removal of existing hardware and the installation of replacement hardware.
 5. Furnish fillers as required after removal of existing hardware.
 6. Modification of labeled doors and frames must be approved and certified by ITS (Intertek Testing Service) or Warnock Hersey.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.9 ACCESSORIES

- A. Louvers: Provide insert type louvers for interior doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.040-inch-thick, cold-rolled steel sheet set into 0.040-inch-thick steel frame. Louvers and frames to be prime coated.
1. Sight-proof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
 2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.

- B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- C. Grout Guards: Formed from same material as frames, not less than 0.016-inch thick.

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. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and without damage to completed Work.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. 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.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - 3. Solidly pack mineral-fiber insulation inside frames.
 - 4. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 - 5. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16-inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16-inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16-inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16-inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below.
- 1. Install hollow metal doors in frames using hardware specified in Section 08 71 00 "Door Hardware". Install securely without marking or defacing hardware or finish work. Protect hardware finishes with suitable protective covering until completion of building.
 - 2. Doors are to be expertly hung and shall fit snug against all stops. After hanging, make all adjustments and remove respective hardware for finish painting where required. Reinstall hardware after finish painting.
 - 3. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8-inch plus or minus 1/32-inch.
 - b. Between Edges of Pairs of Doors: 1/8-inch to 1/4-inch plus or minus 1/32-inch.
 - c. At Bottom of Door without Thresholds: 5/8-inch plus or minus 1/32-inch.
 - d. Between Door Face and Stop: 1/16-inch to 1/8-inch plus or minus 1/32-inch.
- D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove dirt, grout, excess sealant, glazing compounds, mortar and other bonding material from hollow-metal work immediately after installation. Fill all dents and holes with metal filler and sand smooth and flush with adjacent surfaces. Reprime and paint to match finish. Clean and polish.
- C. 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.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

**SECTION 08 14 16
FLUSH WOOD DOORS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with hardwood-veneer faces for storefront frame (for Building A).
 - 2. Factory fitting flush wood doors for storefront frame and factory machining for hardware
 - 3. Provide Factory applied transparent stain on exterior and interior veneer surfaces.
- B. Related Requirements:
 - 1. Section 08 11 13 "Hollow Metal Doors and Frames"
 - 2. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" for Building A
 - 3. Section 08 51 13 "Aluminum Windows" for Building A
 - 4. Section 08 71 00 "Door Hardware" for door hardware for flush wood doors.
 - 5. Section 09 91 13 "Exterior Painting"
 - 6. Section 09 91 23 "Interior Painting"

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site a minimum of two weeks before the start of the Work in this Section. Topics for discussion will include but not be limited to the following:
 - 1. Project schedule requirements
 - 2. Availability of products for timely installation
 - 3. Contract Documents / Scope of work
 - 4. Acceptability of substrates
 - 5. Submittals
 - 6. RFIs
 - 7. Questions Clarifications

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, and trim for openings.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
 - 1. Dimensions and locations of blocking.
 - 2. Dimensions and locations of mortises and holes for hardware.
 - 3. Dimensions and locations of cutouts.
 - 4. Undercuts.
 - 5. Face veneer pattern and species.
 - 6. Requirements for veneer matching.
 - 7. Glazing materials and thickness.
- C. Door Schedule: Indicate opening identifying symbol, size, door type and grade, elevations, light cutouts, swing, undercuts, and fire-classification markings.
- D. 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. Factory samples of each species of veneer and each finish.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.
- C. Certification of Label Construction: For labeled doors, certificate from nationally recognized testing agency stating that component construction conforms to UL rating requirements for the label indicated.
- D. Qualification Data: For Manufacturer, Supplier, and Installer.

1.6 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) current edition
 - 1. Coordinate hardware heights for access compliance requirements

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A Manufacturer qualified to produce doors that meet the current WDMA I.S. 1A Industry Standard for Architectural Wood Flush Doors.
- B. Supplier Qualifications: Supplier shall be a qualified direct distributor of the manufacturer's products. The Supplier shall have in its regular employment a person who is currently certified by DHI as an Architectural Hardware Consultant (AHC) or a Certified Door Consultant (CDC). The Supplier shall be available at reasonable times throughout the Project for consultation with Contractor, Architect, and District Construction Manager. The Supplier shall be available for in-person on-site consultation within 48 hours of first notice.
- C. Installer Qualifications: Firm with a minimum of five years' experience in the installation of flush wood doors and frames similar to the type required for this Project.
- D. The District Construction Manager may select not more than two doors at random for dismantling and inspection of internal construction for compliance with Project Specifications. Provide doors, labor, and tools for inspection under the District Construction Manager's supervision, at Contractor's expense.
- E. Failure of any flush wood door to comply with specified requirements shall be grounds to reject the entire shipment of flush wood doors, as well as to reject the Manufacturer. Items shall be replaced at Contractor's expense, including two additional doors for dismantling and inspection. No extensions of time or additions to the Contract amount will be allowed due to a rejection of material and substitution of the flush wood door Manufacture.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors wrapped in Manufacturer's original unopened protective covering, clearly marked with Manufacturer's name, brand name, and identifying number on the container. Mark each door on top rail with opening number corresponding with the shop drawings and door schedule.
- B. Store and protect doors in accordance with Manufacturer's recommendations and WDMA I.S. 1A.
 - 1. Store doors flat and palletized on a level surface in a dry, well-ventilated space.
 - 2. Keep doors at least 4-inches off the floor with protective coverings under the bottom and over the top of stack. Covering shall protect doors from dirt, water and abuse but allow air circulation under and around the stack.
 - 3. Do not walk on or stack other materials on top of stacked doors.
 - 4. Do not allow doors to come in contact with water.
 - 5. Avoid exposure of interior doors to direct sunlight or extremes of heat or humidity.
 - 6. Always handle doors with clean dry hands or gloves.
 - 7. Always lift and carry doors. Do not drag doors.
 - 8. If cardboard containers become wet, remove and dry contents immediately.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
 - 1. Doors shall be allowed to reach average prevailing temperature and humidity conditions within the area of installation for not less than 48 hours prior to installation.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include:
 - a. Warping (bow, cup, or twist) more than 1/4-inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01-inch in a 3-inch span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Exterior Doors: Two years from date of Substantial Completion.
 - 4. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Masonite Architectural.
 - 2. VT Industries.
 - 3. Or Equal.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL.

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S. 1A, "Architectural Wood Flush Doors."

1. Provide WI Certified Compliance Labels indicating that doors comply with requirements of grades specified.
 - B. WDMA I.S. 1A Performance Grade:
 1. Extra Heavy Duty.
 - C. Structural-Composite-Lumber-Core Doors:
 1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf.
 - b. Screw Withdrawal, Edge: 400 lbf.
- 2.3 I.S. 1A VENEER-FACED DOORS FOR TRANSPARENT FINISH (Building A has twin sets of two double, solid core exterior, wood doors as indicated)
- A. Exterior Solid-Core Doors
 1. I.S. 1A Grade: Premium, with Grade A faces
 2. Species: White Birch
 3. Cut: plain sliced.
 4. Match between Veneer Leaves: Book match.
 5. Assembly of Veneer Leaves on Door Faces: Balance match.
 6. Pair and Set Match: Provide for doors hung in same opening mullions.
 7. Exposed Vertical and Top Edges: Same species as faces or a compatible species - edge Type A.
 8. Core: Structural composite lumber.
 9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
 10. Adhesives: Type I per WDMA T.M.-6.
 11. Factory Finish: Transparent Stain to match Architects sample
- 2.4 FABRICATION
- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 - 1. Fabricate door and transom panels with full-width, solid-lumber , rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Factory cut and trim openings through doors.
 - 1. Light 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 "Glazing."
- E. Exterior Doors: Factory treat exterior doors with water repellent after fabrication has been completed in compliance with WDMA I.S. 4, and provide a minimum water repellent efficiency of 55% as tested per WDMA TM-2.
 - 1. Flash top of out swinging doors with manufacturer's standard metal flashing.

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. Handle doors per recommendations of WDMA I.S. 1A.
- C. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- D. Drill properly sized pilot holes prior to the installation of door hardware to eliminate splits at door edges or face veneer damage.

- E. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8-inch at heads, jambs, and between pairs of doors. Provide 1/8-inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4-inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Bevel non-fire-rated doors 1/8-inch in 2 inches at lock and hinge edges.
- F. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- G. Field finished doors shall comply with WDMA I.S. 1A "Care and Handling at Job Site" instructions for field applied finishes.
- H. At completion of installation, doors shall be undamaged and all surfaces shall be in satisfactory condition for field finishing.
- I. Doors shall be installed to hang plumb and true in frames to contact stops uniformly.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged, that display wood splits in excess of 1/2-inch length at hardware locations, are hinge bound, do not swing or operate freely, 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.
- C. Adjust door hinges to provide uniform clearances at heads, jambs, and floor as indicated below and to contact frame silencers or stops uniformly. Perform these alterations only if doors are not factory pre-fit and pre-machined, or not fire-rated.
 - 1. Fit doors to width by planing equally from both sides.
 - 2. Bevel lock and hinge edges 1/8-inch in 2 inches.
 - 3. Side and top clearance: 1/8-inch.
 - 4. Floor clearance: 3/4-inch.
- D. Re-adjust door heights after carpet installation.

END OF SECTION 08 14 16

SECTION 08 41 13
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior storefront framing.
 - 2. Storefront framing for window walls.
 - 3. Exterior manual-swing entrance doors and door-frame units.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants"
 - 2. Section 08 11 13 "Hollow Metal Doors and Frames" for Building B.
 - 3. Section 08 14 16 "Flush Wood Doors"
 - 4. Section 08 71 00 "Door Hardware".
 - 5. Section 08 80 00 "Glazing".

1.3 COORDINATION

- A. All electrified hardware, including exit devices, shall be by the same manufacturer throughout the project, including storefront entrances and gates. See section 08 71 00 "Door Hardware".

1.4 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site a minimum of two weeks before Work of this Section is to commence.

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. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- F. Entrance Door Hardware Schedule
 - 1. Specified in section 08 71 00 Door "Hardware".
 - 2. Prepared under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.
 - 3. 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.
 - 4. Coordinate electrified door hardware to comply with single source manufacturer requirement specified in section 08 71 00 "Door Hardware".

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and field testing agency.
- B. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.

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- C. Source quality-control reports.
- D. Sealant Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating that materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with sealants; include joint sealant manufacturer's written interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- E. Sample Warranties: For special warranties.
- F. Manufacturer Seismic Qualification Certificate: Submit certification that aluminum-framed entrances and storefronts shall withstand seismic forces defined according to ASCE/SEI 7.

1.7 CLOSEOUT SUBMITTALS

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

1.8 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) current edition

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.
- C. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code – Aluminum".
- D. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, sway, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- B. Structural Loads: As indicated on drawings and below.
- C. Deflection of Framing Members: At design wind pressure, as follows:
 - 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4-inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4-inch, whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8-inch, whichever is smaller.
- D. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- E. Dead Loads: Provide entrance and storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.
1. Provide a minimum 1/8-inch clearance between members and top of glazing or other fixed part immediately below.
 2. Provide a minimum 1/16-inch clearance between members and operable windows and doors.
- F. Live Loads: Provide entrance and storefront systems, including anchorage, that accommodate the supporting structures' deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.
- G. Wind Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of CBC or the ASCE 7, Minimum Design Loads for Buildings and Other Structures, 6.4.2, "Analytical Procedure," whichever are more stringent.
- H. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
 2. Entrance Doors:
 - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
 - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
- I. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. Water leakage is defined as follows:
 - a. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.
 - J. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.
 1. Outdoor-Indoor Transmission Class: Minimum 30
 - K. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone 1.
 1. Large-Missile Test: For glazed openings located within 30 feet of grade.
 - L. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
 - b. Low Exterior Ambient-Air Temperature: 0 deg F.
 - c. Interior Ambient-Air Temperature: 75 deg F.
 - M. Glazing: Physically isolate glazing from framing members.
 - N. Dimensional Tolerances: Provide entrance and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.
- 2.2 MANUFACTURERS
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. EFCO Corporation.
 2. Kawneer North America; an Alcoa company.
 3. Oldcastle BuildingEnvelope™.

- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing spandrel panels, venting windows and accessories, from single manufacturer.

2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally improved.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Front.
 - 4. Finish: Color anodic finish -Dark Bronze (coordinate with Architect)
 - 5. Fabrication Method: Field-fabricated stick system.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Materials:
 - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
 - 2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
 - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 INSULATED SPANDREL PANELS

- A. Insulated Spandrel Panels: Comply with Section 07 42 13.19 "Insulated Metal Wall Panels."

- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.

2.5 ENTRANCE DOOR SYSTEMS

- A. Double Entrance Doors: Wood solid-core doors for manual-swing operation.
 - 1. Door Design: As indicated
 - 2. Glazing Stops and Gaskets: Manufacturer's standard snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide non-removable glazing stops on outside of door.

2.6 ENTRANCE DOOR HARDWARE

- A. General
 - 1. Hardware: Section 08 71 00 "Door Hardware."
- B. Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
 - 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.7 GLAZING

- A. Glazing: Comply with Section 08 80 00 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements.
- C. Glazing Sealants: Comply with Section 08 80 00 "Glazing."

2.8 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, non-bleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.

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2. Reinforce members as required to receive fastener threads.
 3. Do not use exposed fasteners, except for hardware application. For hardware application, use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1-inch dimension that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Dead-soft, 0.018-inch-thick stainless-steel, ASTM A 240/A 240M of type recommended by manufacturer.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.9 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
 2. Accurately fitted joints with ends coped or mitered.
 3. Physical and thermal isolation of glazing from framing members.
 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 5. Provisions for field replacement of glazing .
 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Storefront Framing: Provide subframes and reinforcing of types indicated or, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.
- F. Entrance Door Frames: Fabricate door framing in profiles indicated. Reinforce as required to support loads imposed by door operation and for installing entrance door

hardware. Cut, drill, and tap for factory-installed hardware before finishing components.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual".

J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

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 the 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. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018-mm or thicker.

1. Color: Dark bronze (coordinate with Architect for Building A).

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

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure non-movement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 6. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Set continuous sill members and flashing in full sealant bed as specified in Section 07 92 00 "Joint Sealants" to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Section 08 80 00 "Glazing."
- G. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS**08 41 13 - 11****DEHESA SCHOOL MODERNIZATION**

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.

3.3 ERECTION TOLERANCES

- A. Erection Tolerances: 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.
 - d. Diagonal Measurements: Limit difference between diagonal measurements to 1/8-inch.
4. Location: Limit variation from plane to 1/8-inch in 12 feet; 1/2-inch over total length.

3.4 ADJUSTING AND CLEANING

- A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.
- B. Remove excess sealant and glazing compounds and dirt from surfaces.

3.5 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

3.6 MAINTENANCE SERVICE

- A. Entrance Door Hardware:
 1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for District's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

SPECIFICATION

NO. 22-0400

END OF SECTION 08 41 13

**ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
08 41 13 - 13
DEHESA SCHOOL MODERNIZATION**

SECTION 08 51 13
ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes fixed exterior aluminum windows
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants".
 - 2. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units.
 - 3. Section 08 80 00 "Glazing"

1.3 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site a minimum of two weeks prior to the start of Work in this Section. Agenda items will include but not be limited to the following:
 - 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 anchorage, flashing, 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.

1.4 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, insect screens, 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 color finishes.
 - 1. Include similar Samples of hardware and accessories involving color selection.
- E. Samples for Verification: For aluminum windows and components required, showing full range of color variations for finishes, and prepared on Samples of size indicated below:
 - 1. Exposed Finishes: 2-by-4 inches.
 - 2. Exposed Hardware: Full-size units.
- F. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- C. Sample Warranties: For manufacturer's warranties.

1.6 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) current edition

1.7 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.

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
 - c. Deterioration of materials and finishes beyond normal weathering.
 - d. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Window: Two years from date of Substantial Completion.
 - b. Glazing Units: Ten years from date of Substantial Completion.
 - c. Aluminum Finish: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.2 WINDOW 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.
 - 1. Window Certification: AMMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 - 1. Minimum Performance Class: CW .
 - 2. Minimum Performance Grade: 30.

- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.60 Btu/sq. ft. x h x deg F .
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.69 for fixed windows.
- E. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation 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 temperature change.
- F. Sound Transmission Class (STC): Rated for not less than 26 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- G. Outside-Inside Transmission Class (OITC): Rated for not less than 22 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

2.3 ALUMINUM WINDOWS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Arcadia, Inc.
 - 2. EFCO Corporation.
 - 3. Fleetwood Windows & Doors.
 - 4. Winco Windows.
- B. Frames and Sashes: Aluminum extrusions complying with AAMA / WDMA / CSA 101 / I.S.2 / A440.
 - 1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
- C. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3. (Refer to Section 08 80 00 Glazing)
 - 1. Kind: Fully tempered
- D. Insulating-Glass Units: ASTM E 2190.

1. Glass: ASTM C 1036, Type 1, Class 1, q3. (Refer to Section 08 80 00 Glazing)
 - a. Tint: Clear
 - b. Kind: Fully tempered
 2. Lites: Two.
 3. Filling: Fill space between glass lites with argon.
 4. Low-E Coating: Sputtered on second or third surface
- E. Glazing System: (Refer to Section 08 80 00 Glazing).
1. Dual Glazing:
 - a. Interior Lite: FT, Fully Tempered
 - b. Exterior Lite: FT, Fully Tempered

2.4 ACCESSORIES

- A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.
- B. Column Covers: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
- C. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
- D. Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
- E. Receptor System: Two-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.

2.5 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Provide units that are reglazable without dismantling sash or ventilator framing.
- D. Weather strip each operable sash to provide weathertight installation.
- E. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

- F. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design wind loads of window units.
- G. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.6 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: 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 the 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.

2.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018-mm or thicker) complying with AAMA 611.
 - 1. Color: Dark bronze (as selected by Architect from full range of industry colors and color densities).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine 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.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- 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.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 08 51 13

**SECTION 08 71 00
DOOR HARDWARE****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - 2. Cylinders for door hardware specified in other Sections.
- B. Related Sections:
 - 1. Section 08 11 13 "Hollow Metal Doors and Frames".
 - 2. Section 08 14 16 "Flush Wood Doors".
 - 3. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" for installation of entrance door hardware.
 - 4. Section 28 31 00 "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion-detection system.
 - 5. Section 28 46 21.11 "Addressable Fire-Alarm Systems" for connections to building fire-alarm system.
 - 6. Section 32 31 13 "Chain Link Fences and Gates" for coordination of electrified hardware and balance of hardware for chain link gates.
 - 7. Section 32 31 19 "Decorative Metal Fences and Gates" for coordination of electrified hardware and balance of hardware for decorative metal gates.

1.3 ABBREVIATIONS

- A. The following abbreviations are used to identify manufacturers in Part 3 Door Hardware Schedule Article.
 - 1. B/O (By Others).
 - 2. DON (Don-Jo).
 - 3. IVE (Ives, an Allegion brand).
 - 4. LCN (LCN, an Allegion brand).

5. LOX (Locinox).
6. SCH (Schlage, an Allegion brand).
7. UNK (Unknown).
8. VON (Von Duprin, an Allegion brand).
9. ZER (Zero International, Inc., an Allegion brand).

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 District's security consultant.
- C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operations.

1.5 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. Inspect and discuss preparatory work performed by other trades.
- B. Keying Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." In addition to District Construction Manager, Contractor, and Architect, conference participants shall also include Supplier's Architectural Hardware Consultant and District's security consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 2. Preliminary key system schematic diagram.
 3. Requirements for key control system.
 4. Requirements for access control.
 5. Address for delivery of keys.

1.6 ACTION SUBMITTALS

- A. **Product Data:** For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. **Samples for Verification:** For exposed door hardware of each type required, in each finish specified, prepared on Samples of size indicated below. Tag Samples with full description for coordination with the door hardware schedule. Submit Samples before, or concurrent with, submission of door hardware schedule.
 - 1. **Sample Size:** Full-size units or minimum 2-by-4-inch samples for sheet and 4-inch long Samples for other products.
 - a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
- C. **Other Action Submittals:**
 - 1. **Door Hardware Schedule:** Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. **Submittal Sequence:** Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
 - b. **Format:** Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
 - c. **Content:** Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Fastenings and other pertinent information.
 - 5) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 6) Mounting locations for door hardware.

- 7) List of related door devices specified in other Sections for each door and frame.
2. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing District's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Architectural Hardware Consultant.
- B. Product Certificates: For door hardware, from the manufacturer.
 1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
- C. Product Test Reports: For compliance with requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency for locks, latches and closers.
- D. Field quality control test reports.
- E. Warranty: Special warranty specified in this Section.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

1.9 QUALITY ASSURANCE

- A. Supplier Qualifications: Supplier shall be a qualified direct distributor of the manufacturer's products. The Supplier shall be available for in-person on-site consultation within 48 hours of first notice.
- B. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers.
 1. Warehousing Facilities: In Project's vicinity.
 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- C. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.

- D. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 3.0 cfm/sq. ft. at the tested pressure differential of 0.1-inch wg of water.

1.10 REGULATORY REQUIREMENTS (CODE CITATIONS ARE CBC 2022)

- A. Doors/doorways as part of an accessible route shall comply with CBC Sections 11B-404.
- B. The clear opening width for a door shall be 32" minimum. For a swinging door it shall be measured between the face of the door and the stop, with the door open 90 degrees. There shall be no projections into it below 34" and 44" maximum projections into it between 34" and 80" above the finish floor or ground. Door closers and stops shall be permitted to be 78" minimum above the finish floor or ground. CBC Section 11B-404.2.3.
- C. Handles, pulls, latches, locks, and other operable parts on accessible doors shall comply with CBC Section 11B-309.4 and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34" minimum and 44" maximum above finish floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides. CBC section 11B-404.2.7
- D. The force for pushing or pulling open a door shall be as follows: CBC Section 11B-404.2.9.
1. Interior hinged doors, sliding or folding doors, and exterior hinged doors: 5 pounds (22.2 N) maximum. Required fire doors: the minimum opening force allowable by the DSA authority, not to exceed 15 pounds (66.7N). 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.
 2. The force required for activation any operable parts, such as lever hardware, or disengaging other devices shall be 5 pounds (22.2N) maximum to comply with CBC Section 11B-309.4.
- E. Door closing speed shall be as follows per CBC Section 11B-404.2.8:
1. Closer shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is 5 seconds minimum.
 2. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is 1.5 seconds minimum.
- F. Thresholds shall comply with CBC Section 11B-404.2.5.
- G. Floor stops shall not be located in the path of travel and 4" maximum from walls.

- H. Hardware (including panic hardware) shall not be provided with “Night Latch” (NL) function for any accessible doors or gates unless the following conditions are met: (Such conditions must be clearly demonstrated and indicated in the specifications)
1. Such hardware has a ‘dogging’ feature.
 2. It is dogged during the time the facility is open.
 3. Such ‘dogging’ operation is performed only by employees as their job function (non-public use).

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to District.

1.12 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
1. Failures include:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 2. Warranty Period: Two years from date of Substantial Completion, except as follows:
 - a. Mortise Locksets: Three years mechanical and one year electrical from date of Substantial Completion.
 - b. Exit Devices: Three years mechanical and one year electrical from date of Substantial Completion.
 - c. Closers: Thirty years mechanical and two years electrical from date of Substantial Completion.

1.13 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for District's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Source Limitations: Obtain each type of door hardware from a single manufacturer.

2.2 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA designations referenced.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturers' Products: Manufacturer and product designations are listed for each door hardware item for the purpose of establishing minimum requirements and level of quality. Provide products complying with these requirements for description, quality, and function.

2.3 HINGES, GENERAL

- A. Quantity: Provide the following, unless otherwise indicated:
 - 1. Two Hinges: For doors with heights up to 60 inches.
 - 2. Three Hinges: For doors with heights 61 to 90 inches.
 - 3. Four Hinges: For doors with heights 91 to 120 inches.
 - 4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
- B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- C. Hinge Sizes: Unless otherwise indicated in the Hardware Sets, provide the following:
 - 1. 3-1/2-inch-by-3-1/2-inch by .123-inch-thick for 1-3/8-inch-thick doors.

2. 4-1/2-inch by 4-1/2-inch by .180-inch-thick for 1-3/4-inch-thick doors, up to 36-inch wide.
 3. 5-inch-by-4-1/2-inch by .190-inch-thick for 1-3/4-inch thick doors, greater than 36-inch to 48-inch wide.
 4. Use manufacturers guidelines for all others door thicknesses.
- D. Hinge Weight: Unless otherwise indicated in the Hardware Sets, provide the following:
1. Entrance Doors: Heavy-weight hinges.
 2. Doors with Closers: Antifriction-bearing hinges.
 3. Interior Doors: Heavy-weight hinges.
- E. Hinge Base Metal: Unless otherwise indicated in the Hardware Sets, provide the following:
1. Exterior Hinges: Stainless-steel, with stainless-steel pin.
 2. Interior Hinges: Steel, with steel pin except at corrosive areas.
 3. Hinges for Fire-Rated Assemblies: Steel, with steel pin at interior locations and stainless steel, with stainless-steel pin at exterior locations.
- F. Hinge Options: Where indicated in door hardware sets or on Drawings:
1. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for out-swinging exterior doors and out-swinging corridor doors with locks.
 2. Corners: Square.
- G. Fasteners: Comply with the following:
1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
 2. Wood Screws: For wood doors and frames.
 3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
 4. Screws: Phillips flat-head; machine screws (drilled and tapped holes) for metal doors and wood screws for wood doors and frames. Finish screw heads to match surface of hinges.
- 2.4 HINGES
- A. Butts and Hinges: BHMA A156.1.
- B. Template Hinge Dimensions: BHMA A156.7.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ives, an Allegion brand.
 2. Or Equal.

2.5 CONTINUOUS HINGES

- A. Continuous Hinges: BHMA A156.26, Grade 1-600; minimum 0.120-inch-thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
- B. Pin-and-Barrel-Type Hinges: Continuous, stainless-steel, pin-in-barrel, hinge leaves joined by a continuous channel cap; with concealed, self-lubricating thrust bearings.
 - 1. Fire Pins: Steel pins to hold labeled fire doors in place if required by tested listing.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ives, an Allegion brand.
 - 2. Or Equal.

2.6 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
 - 2. Deadbolts: Minimum 1-inch bolt throw.
- C. Lock Backset: 2-3/4 inches, unless otherwise indicated.
- D. Lock Trim:
 - 1. Levers: Forged or Cast.
 - 2. Escutcheons: Wrought.
 - 3. Dummy Trim: Match lever lock trim and escutcheons.
 - 4. "Locked" indicator on interior of all classroom locks.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
 - 3. Strikes for Mortise Locks and Latches: BHMA A156.13.

- F. Mortise Locks: BHMA A156.13; Operational Grade 1, Security Grade 1; cold-rolled steel case with steel or brass parts; Series 1000.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Schlage, an Allegion brand.

2.7 AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

- A. Automatic and Self-Latching Flush Bolts: BHMA A156.3, Grade 1; minimum 3/4-inch throw; designed for mortising into door edge.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ives, an Allegion brand.
 - b. Or Equal.

2.8 DUSTPROOF STRIKES

- A. BHMA A156.16, Grade 1.

2.9 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3, Grade 1, and additionally meeting the following requirements:
1. Mortise type exit devices to be certified by an independent testing lab for a minimum 10,000,000 cycles.
 2. Rim type exit devices to be certified by an independent testing lab for a minimum 5,000,000 cycles.
 3. Surface and Concealed vertical rod type exit devices to be certified by an independent testing lab for a minimum 1,000,000 cycles.
 4. Furnish roller strikes for all rim and surface vertical rod exit devices.
 5. Device rail shall be extruded with reinforced corners.
 6. All internal springs to be coil compression type.
 7. Furnish security dead latching for all active latch bolts with 3/4-inch throw.
 8. Latch bolts to have self-lubricating coating to reduce friction and wear. Plated latch bolts not accepted.
 9. End cap shall be impact-resistant, constructed of cast or forged material and shall not overlap the mechanism case. No raised edges or lips to catch carts or other equipment.
 10. Devices to have no exposed rivets or screws on back of device that would be visible through a glass light.
 11. Non-Fire Rated Devices: Provide cylinder dogging.

- a. Dogging mechanisms containing plastic parts are not acceptable.
- 12. Field drill weep holes as per manufacturer's instructions for exit devices used in full exterior applications, highly corrosive environments and where noted in the hardware sets.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Von Duprin, an Allegion brand.
- C. Exit Devices for Means of Egress Doors: Comply with CBC.
- D. Panic Exit Devices: Listed and labeled by a nationally recognized testing and inspection agency, for panic protection, based on testing according to UL 305.
- E. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a nationally recognized testing and inspecting agency, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- F. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key. Furnish storage brackets for securely stowing the mullion away from the door when removed.
- G. Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a nationally recognized testing and inspecting agency, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.
- H. Outside Trim: Lever, Lever with cylinder, Pull or Pull with cylinder as indicated in the Hardware Sets; material and finish to match locksets, unless otherwise indicated.
 - 1. Where lever trim is specified match lever design for locksets and latchsets, unless otherwise indicated.
 - a. Levers shall be solid forged brass or bronze, complete with coil compression springs with shear pin protection.
 - b. Escutcheons of all lever trim shall be forged brass or bronze with four thru-bolts anchoring trim assembly to exit device chassis.
 - c. Cylinders shall be recessed in trim from face of escutcheon.
 - d. Lever trim shall be designed with breakaway feature to allow trim to freely rotate while remaining secure, preventing damage to internal components from vandalism by excessive force. Lever trim shall match lever trim specified for locksets and latchsets.
 - 2. Pull type trim shall be minimum 11 gauge material, thru bolted to exit device center case.

- I. Through Bolts: Provide for exit devices on non-fire-rated wood doors and fire-rated wood doors.

2.10 LOCK CYLINDERS

- A. Lock Cylinders: Manufacturer's full size standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
 - 1. Number of Pins: Six.
 - 2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
 - 3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
- B. Manufacturer: Same manufacturer as for locking devices.
- C. Standard Lock Cylinders: BHMA A156.5; Grade 1; face finished to match lockset.
- D. Construction Keying: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 12 construction master keys.

2.11 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
 - 1. Existing Keying System:
 - a. Master key or grand master key locks to District's existing system. Confirm existing key system through RFI process after Contract award. Do not contact District Lock Shop.
- B. Keys: Nickel silver.
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."
 - 2. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.
 - c. Grand Master Keys: Five.
 - d. Great-Grand Master Keys: Five.

2.12 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; brass, bronze, or stainless steel, unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ives, an Allegion brand.
 - b. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
 - c. Trimco.
 - d. Or Equal.

2.13 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release and with internal override.
- B. Astragals: BHMA A156.22.

2.14 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4 Grade 1. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force. Comply with the following:
 - 1. Full rack-and-pinion type cylinder with removable metal cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
 - 2. ISO 2000 certified. Units stamped with date-of-manufacture code.
 - 3. Closers shall exceed 10 million (10,000,000) full load operating cycles, as tested by a nationally recognized independent testing laboratory.
 - 4. Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.
 - 5. Provide plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
 - 6. Separate adjusting valves for closing speed, latching speed and backcheck, with fourth valve for delayed action where scheduled.
 - 7. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
 - 8. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test. Furnish data on request.
 - 9. Exterior doors: seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F. Furnish checking fluid data on request.
 - 10. Non-flaming fluid; will not fuel door or floor covering fires.
 - 11. Pressure Relief Valves (PRV) not permitted.

12. Metal Closer Covers shall be secured with TORX style screws to prevent vandalism and cover removal.
13. Provide correct brackets required to mount closers on interior side of room.

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

1. LCN, an Allegion brand.

2.15 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16, Grade 1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ives.
 - b. Or Equal.

2.16 DOOR SILENCERS

A. Silencers for Wood and Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum 1/2-inch diameter; fabricated for drilled-in application to frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ives.
 - b. Or Equal.

2.17 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

B. Smoke- Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a nationally recognized testing and inspecting agency, for smoke-control ratings indicated, based on testing according to UL 1784.

1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.

C. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a nationally recognized testing and inspecting agency, for fire ratings indicated, based on testing according to UL10C (Positive Pressure).

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- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E1408.
- E. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Zero International, Inc.
 - 2. Or Equal.

2.18 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Zero International, Inc.
 - b. Or Equal.

2.19 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; beveled top and sides; fabricated from material indicated in Hardware Sets; with manufacturer's standard machine or self-tapping screw fasteners with oval heads; sized 1-1/2-inch less than door width on push side of door and 1/2-inch less than door width on pull side of door, by height indicated in Hardware Sets. Plates over 16 inches above finish floor mounted on fire rated doors shall be labeled.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Or Equal.

2.20 FABRICATION

- A. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not provide manufacturer's standard materials or forming methods if different from specified standard.
- B. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum

fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware.
2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames; wood screws for wood doors and frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.
 - b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.21 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. 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 the 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.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.

- E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07 92 00 "Joint Sealants."
- F. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic or more than 4 inches from wall.
- G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- H. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DOOR HARDWARE SCHEDULE

OVERTUR: OPT0341802 (VER. 4)

SPECIFICATIONS**NO. 22-0400****HW SET: 01**

DOOR NUMBERS:

A-1A A-1B

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
2	EA	CONT. HINGE	700	630	IVE
1	EA	CONST LATCHING BOLT	FB61P	630	IVE
1	EA	DUST PROOF STRIKE	DP1 OR DP2 AS REQ'D	626	IVE
1	EA	CLASSROOM SECURITY W/ INSIDE INDICATOR	LV9071L 03N 10-072 7/8" LIP IS- LOC	626	SCH
2	EA	MORTISE CYLINDER	MATCH SITE STANDARD	626	UNK
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA (AS REQ'D)	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61 (AS REQ'D)	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	FLOOR STOP	FS441/444 AS REQ'D	626	IVE
1	EA	PERIMETER SEALS	BY ALUMINUM FRAME MANUFACTURER		B/O
2	EA	DOOR SWEEP	339AA	AA	ZER
1	EA	ASTRAGAL	44ST X 188	STST	ZER
1	EA	THRESHOLD	103A-223 OR AS REQUIRED	A	ZER

HW SET: 02

DOOR NUMBERS:

B-1C

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	EA	DBL CYL STORE W/DB W/ OUTSIDE INDICATOR W/ INSIDE INDICATOR	L9466L 03N OS-LOC IS-LOC	626	SCH
2	EA	MORTISE CYLINDER	MATCH SITE STANDARD	626	UNK
1	EA	SURFACE CLOSER	4040XP H REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/438 AS REQ'D	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

SPECIFICATIONS**NO. 22-0400****HW SET: 03**

DOOR NUMBERS:

B-4A

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CONT. HINGE	700	630	IVE
1	EA	CLASSROOM SECURITY W/ INSIDE INDICATOR	LV9071L 03N IS-LOC	626	SCH
2	EA	MORTISE CYLINDER	MATCH SITE STANDARD	626	UNK
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	328AA HEAD AND JAMBS	AA	ZER
1	EA	AUTO DOOR BOTTOM	355AA	AA	ZER
1	EA	THRESHOLD	103A-223 OR AS REQUIRED	A	ZER

HW SET: 04

DOOR NUMBERS:

B-5A

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 03N	626	SCH
1	EA	FLOOR STOP	FS436/438 AS REQ'D	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 05

DOOR NUMBERS:

A-1C

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	PANIC HARDWARE	LD-PA-AX-99-EO	626	VON
1	EA	PERIMETER SEALS	BY ALUMINUM FRAME MANUFACTURER		B/O
1	EA	DOOR SWEEP	339AA	AA	ZER
1	EA	THRESHOLD	103A-223 OR AS REQUIRED	A	ZER

REUSE EXISTING PANIC DEVICE TRIM AND CYLINDER WITH NEW PANIC DEVICE.
BALANCE OF EXISTING HARDWARE TO REMAIN.

SPECIFICATIONS**NO. 22-0400****HW SET: 06**

DOOR NUMBERS:

A-1D

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	EXIT LOCK	L9025 03N	626	SCH
1	EA	PERIMETER SEALS	BY ALUMINUM FRAME MANUFACTURER		B/O
1	EA	DOOR SWEEP	339AA	AA	ZER
1	EA	THRESHOLD	103A-223 OR AS REQUIRED	A	ZER
1	EA	WRAP AROUND PLATE	504 CW	630	DON

BALANCE OF EXISTING HARDWARE TO REMAIN.

HW SET: 07

DOOR NUMBERS:

A-4A

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	HOLE FILLER PLATE	BF-161	600	DON
1	EA	EDGE FILLER PLATE	EF-161	600	DON

REMOVE DEADBOLT AND INSTALL FILLER PLATES.

BALANCE OF EXISTING HARDWARE TO REMAIN.

HW SET: 08

DOOR NUMBERS:

B-1A

B-1B

B-2A

B-2B

B-3A

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	PANIC HARDWARE	CDSI-PA-AX-99-NL-OP-110MD	626	VON
1	EA	MORTISE CYLINDER	MATCH SITE STANDARD (FOR CYL. DOGGING)	626	UNK
1	EA	RIM CYLINDER	MATCH SITE STANDARD	626	UNK
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	DOOR SWEEP	339AA	AA	ZER
1	EA	THRESHOLD	103A-223 OR AS REQUIRED	A	ZER

BALANCE OF EXISTING HARDWARE TO REMAIN.

SPECIFICATIONS**NO. 22-0400****HW SET: 09**

DOOR NUMBERS:

B-6A

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CORRIDOR W/DEADBOLT W/ OUTSIDE INDICATOR	LV9456L 03N L583-363 OS-OCC	626	SCH
1	EA	MORTISE CYLINDER	MATCH SITE STANDARD	626	UNK
1	EA	WRAP AROUND PLATE	504 CW	630	DON
1	EA	HOLE FILLER PLATE	BF-161	600	DON

REMOVE DEADBOLT AND INSTALL FILLER PLATE.
BALANCE OF EXISTING HARDWARE TO REMAIN.

HW SET: 10

DOOR NUMBERS:

B-7A

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CORRIDOR W/DEADBOLT W/ OUTSIDE INDICATOR	LV9456L 03N L583-363 OS-OCC	626	SCH
1	EA	MORTISE CYLINDER	MATCH SITE STANDARD	626	UNK
1	EA	WRAP AROUND PLATE	504 CW	630	DON

BALANCE OF EXISTING HARDWARE TO REMAIN.

HW SET: 11

DOOR NUMBERS:

A-2A

A-3A

A-5A

B-1D

B-1E

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
	EA	NOTE	REUSE ALL EXISTING HARDWARE		B/O

NOTE: EXISTING HARDWARE HAS BEEN SITE VERIFIED.

SPECIFICATIONS**NO. 22-0400****HW SET: G01**

DOOR NUMBERS:

G-5

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	GATE CLOSER AND HINGE	MAMMOTH-180	AL	LOX
1	EA	PANIC HARDWARE	CDSI-PA-AX-99-NL-OP-110MD-WH	628	VON
1	EA	MORTISE CYLINDER	MATCH SITE STANDARD (FOR CYL. DOGGING)	626	UNK
1	EA	RIM CYLINDER	MATCH SITE STANDARD	626	UNK
1	EA	DOOR PULL	VR910 NL	630	IVE

BALANCE OF HARDWARE BY GATE MANUFACTURER.

HW SET: G02

DOOR NUMBERS:

G-4

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	GATE CLOSER AND HINGE	MAMMOTH-180	AL	LOX
1	SET	CHAIN LINK BRACKET	CLB-MAMMOTH	AL	LOX
1	EA	WELDABLE GATE BOX	K-BX515175	600	KEE
1	EA	PANIC HARDWARE	CDSI-PA-AX-99-NL-OP-110MD-WH	628	VON
1	EA	MORTISE CYLINDER	MATCH SITE STANDARD (FOR CYL. DOGGING)	626	UNK
1	EA	RIM CYLINDER	MATCH SITE STANDARD	626	UNK
1	EA	DOOR PULL	VR910 NL	630	IVE

BALANCE OF HARDWARE BY GATE MANUFACTURER.

DOOR/HARDWARE INDEX

Door Numbers	HwSet #
A-1A	01
A-1B	01
A-1C	05
A-1D	06
A-2A	11
A-3A	11
A-4A	07
A-5A	11
B-1A	08
B-1B	08
B-1C	02

SPECIFICATIONS**NO. 22-0400**

Door Numbers	HwSet #
B-1D	11
B-1E	11
B-2A	08
B-2B	08
B-3A	08
B-4A	03
B-5A	04
B-6A	09
B-7A	10
G-4	G02
G-5	G01

END OF SECTION 08 71 00

**DOOR HARDWARE
08 71 00 - 24
DEHESA ELEMENTARY SCHOOL**

SECTION 08 80 00**GLAZING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes:
 - 1. Glass for windows storefront framing and glazed entrances.
 - 2. Glazing sealants and accessories.
 - 3. Mock-ups.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants"
 - 2. Section 08 11 13 "Hollow Metal Doors and Frames"
 - 3. Section 08 14 16 "Flush Wood Doors"
 - 4. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts"
 - 5. Section 08 51 13 "Aluminum Windows"

1.3 DEFINITIONS

- A. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- B. CBC: California Building Code.
- C. Interspace: Space between lites of an insulating-glass unit.

1.4 REFERENCE STANDARDS

- A. ASTM C1036 – Standard Specification for Flat Glass (flat, for glazing, mirrors, and other uses).
- B. ASTM C920 – Standard Specification for Elastomeric Joint Sealants (Sealing Compound, Synthetic Rubber base, Single Component, Chemical Curing for Caulking, Sealing and Glazing in Building Construction).

GLAZING**08 80 00 - 1****DEHESA SCHOOL MODERNIZATION**

SPECIFICATION

NO. 22-0400

- C. AAMA 800 and AAMA 807.3 - Non-skinning Resilient Preformed Compounds - Tapes, Ribbons, Beads with Release Paper.
- D. ANSI Z97.1
- E. GANA – Glass Association of North America
- F. 16 CFR 1201
- G. Chapter 24, Part 2, Title 24, California Building Code, 2016.
- H. NFPA 80

1.5 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.6 PREINSTALLATION MEETING

- A. Preinstallation Conference: Conduct conference at Project site a minimum of two weeks before Work of this Section is to commence. Agenda items will include but not be limited to the following:
 - 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 temporary protection requirements for glazing during and after installation.
 - 3. Review types of glazing and locations
 - 4. Contract Documents
 - 5. Safety glass requirements and locations
 - 6. RFI's
 - 7. Submittals
 - 8. Temporary protection of installed glass
 - 9. Questions and Clarifications

1.7 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 the following products: 12 inches square.
 - 1. Insulating glass.

SPECIFICATION

NO. 22-0400

- C. Glazing Accessory Samples: For sealants and spacers, in 12-inch lengths. Install sealant samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Certifications:
 - 1. Submit Glass Manufacturer's and Glass Fabricator's written confirmation that the glazing materials as specified are appropriate for the specific conditions indicated in 1.9 and 2.2. If Glass Manufacturer or Glass Fabricator takes exception to the types of glazing materials specified for the specific conditions indicated, provide Glass Manufacturer's or Glass Fabricators written rationale and recommendations for modifying glazing.
 - 2. Certify that the following materials and products and processes conform to these Contract Documents and submit in accordance with other sections of these specifications:
 - a. Sealants
 - b. Neoprene, nylon, etc.
 - c. Glass
 - d. Compatibility of materials, finishes, methods of application.

1.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturers of insulating-glass units with sputter-coated, low-E coatings.
- B. Product Certificates: For glass.
- C. Product Test Reports: For insulating glass and glazing sealants, for tests performed by a qualified testing agency.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.
- E. SWRI Validation Certificate: For each elastomeric glazing sealant specified to be validated by SWRI's Sealant Validation Program.
- F. Sample Warranties: For special warranties.

1.9 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) current edition.
 - 1. Comply with Chapter 24, Part 2 Title 24

1.10 QUALITY ASSURANCE

- A. **Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings:** A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer. Minimum of 5 years' experience in the production of architectural glazing.
- B. **Installer Qualifications:** A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors [and who employs glazing technicians certified under the Architectural Glass and Metal Technician (AGMT) certification program].
- C. **Glass Testing Agency Qualifications:** A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. **Sealant Testing Agency Qualifications:** An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. **Glass Performance**
 - 1. The maximum overall size, minimum thickness, and type of glass is to conform to the applicable glass manufacturer's published recommendations for the openings or sizes indicated on the drawings, and the performance requirements specified in these specifications.
 - 2. Ensure that glass and glazing components conform to governing codes and regulations.
 - 3. Produce glass to perform to a specified safety factor of 2.5 and sustain at a maximum wind loading of a statistical glass breakage of no more than eight lites in one thousand.
 - 4. Units shall carry CBA rating as established by ASTM E774 and shall have an initial frost point less than -60 degrees F when tested per ASTM E576.
- F. Be responsible for correct selection of glass including required accommodations for conditions of thermal stress, venting, wind loading and other factors which can reasonably be inferred from manufacturer's web site, the project drawings, and location of the project.
- G. **Safety Glazing:** All glass to be tempered.
- H. **Manufacturer's Instructions and recommendations:** Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing not otherwise defined in this section or referenced standards.
 - a. GANA Publications
 - b. AAMA Publications
 - c. IGMA/IGMAC Publications
- I. **Glazing Mockup** (coordinate with Architect on locations)

1. Building A: provide mockup for storefront head, sill, and jamb conditions. Provide mock-up for the typical aluminum framed windows, head, jamb, and sill conditions.
2. Building B: provide mockup for hollow metal window with head, jamb, and sill conditions.

1.11 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 3. Test no fewer than three Samples of each type and finish of glass-framing members and each type, class, kind, condition, and form of glass (monolithic, laminated, and insulating units) as well as one sample of each glazing accessory (gaskets, tape sealants, spacers, setting blocks, shims, sealant backings, secondary seals, and miscellaneous materials).
 4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
 5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.
- C. Protect glass from vandalism and damage during storage resulting in unseen edge damage and weakening of individual glass units.

1.13 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 are below 40 deg F.

1.14 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

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

- B. 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.

- C. Manufacturer's Special Warranty for 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Viracon
 2. Vitro Architectural Glass (**Basis of Design Solarban 90**)
 3. Or Equal.
- B. Certified Fabricators

1. Oldcastle Building Envelope: IGU
 2. Trulite, Glass and Aluminum Solutions: IGU
 3. Glasswerks LA Inc.: IGU
- C. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- D. Obtain tinted glass from single source from single manufacturer.
- E. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

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. Safety Glazing: Provide tempered glazing for IGU (inboard and outboard glazing) at all new glazing locations, provide glazing that complies with 16 CFR 1201, Category II.
1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
- C. 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 insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 3. 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.
 4. 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.
 5. 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 is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. 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.
1. Minimum Glass Thickness for Exterior and Interior Lites: 6-mm.
 2. Thickness of Glass: Provide same thickness throughout Project.
- E. Strength: Provide fully tempered glass for inboard and outboard IGU lites at all locations.

2.4 GLASS PRODUCTS

- A. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) and 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 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
1. Provide Kind FT (fully tempered) for interior and exterior lites at all locations for requiring new glazing.
 2. Sealing System: Dual seal, with polyisobutylene and silicone primary and secondary sealants.
 3. Perimeter Spacer: Manufacturer's standard spacer material and construction complying with the following requirements:
 - a. Aluminum with bronze color-anodized finish selected by Architect
 4. Desiccant: Molecular sieve or silica gel, or a blend of both.
 5. Corner Construction: Manufacturer's standard.

- B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of Part 3 are nominal. The overall thickness of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

2.6 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 - 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. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920 and additional requirements indicated for single component silicone sealants.
 - 1. Movement Capability: Where movement capability is specified, provide products with the capability when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements in ASTM C 920 for uses indicated.
- C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. Pecora Corp.
 - c. Tremco Incorporated.
 - d. Or Equal.
- D. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. Pecora Corporation.
 - c. Tremco Incorporated.

d. Or Equal.

2.7 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 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.8 GLAZING GASKETS

- A. Soft Compression Gaskets: Extruded or molded, closed cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:
1. EPDM.
 2. Silicone.
 3. Thermoplastic polyolefin rubber.

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: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

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.
- D. Insulating Glass Units:
 - 1. Secondary seal shall extend from exterior face of inner glass pane to interior face of exterior glass pane and shall not contain any of the contaminants or imperfections described below.
 - 2. Primary seal shall not contain fingerprints, dirt, debris, or any other contaminant that may affect adhesion or continuity of the seal.
 - 3. Primary seal shall not be reduced to less than 1/8 in. in width at any point along the perimeter of the insulating glass unit or 1/32 in. in thickness (side of spacer shall not be visible through a "transparent" layer of thin primary seal).
 - 4. Primary and Secondary seal shall not contain voids and must be continuously bonded to the surface of the glass.
 - 5. Primary seal shall not bleed past the spacer bar to the IGU interior.

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. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. 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.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. 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.
- H. 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.

GLAZING**08 80 00 - 12****DEHESA SCHOOL MODERNIZATION**

- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. 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.
- L. 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.
- M. All Glass shall "float" in the opening and shall be fully separated from contacting mullion fasteners, and other ridge components, at all times, including while in service.
- N. Remove lacquer and other coatings from glazing rabbets. Thoroughly clean areas to receive glass and glazing materials. The installation shall be in strict accordance with the recommendations of window, glass, and sealant manufacturers. Glass shall be installed so that no metal to glass contact occurs.
- O. Installation shall be in accordance with the applicable requirements of the latest edition of the "Glazing Manual" of the Flat Glass Marketing Association. Where vinyl or neoprene glazing beads or channels are used, they shall be in one piece for each edge of glass, with corners neatly mitered and tightly fitted together. Allow gaskets to relax and recover several hours prior to installation. All gaskets shall be oversized 1% to 2% in length beyond the daylight dimensions for the glass. Install gaskets by inserting gaskets at ends and center first, then crowding remainder of gasket length into the rabbet.

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.

GLAZING

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DEHESA SCHOOL MODERNIZATION

- 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. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface.
- B. Immediately after installation remove non-permanent labels and clean surfaces.
- C. 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.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- E. 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 MONOLITHIC GLASS SCHEDULE**3.9 INSULATING GLASS SCHEDULE (Basis of Design Solarban 90)**

- A. Glass Type GL-#1: Low-E-coated, Class II, insulating glass.
 - 1. Overall Unit Thickness: 1-inch.
 - 2. Minimum Thickness of Each Glass Lite: 6-mm (1/4 inch).
 - 3. Outdoor Lite: Tinted fully tempered float glass.
 - 4. Tint Color: Clear (Solarban 90)
 - 5. Interspace Content: Argon.
 - 6. Indoor Lite: Class I, fully tempered float glass. (typical at all new glass locations)
 - 7. Low-E Coating: Sputtered on second surface.
 - 8. Winter Nighttime U-Factor: .29
 - 9. Visible Light Transmittance: 51 percent minimum.
 - 10. Solar Heat Gain Coefficient: .23 maximum.
 - 11. Light to Solar Gain: 2.22
 - 12. Safety glazing required. Yes

3.10 GLAZING SEALANT SCHEDULE

- A. Joint-Sealant Application: Non-staining silicone glazing sealant for exterior vertical non-traffic surfaces
1. Uses related to Joint Substrates: M, G, A and applicable substrates indicated O.
 - a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and wood.
 2. Joint Locations:
 - a. Glazing sealant
 - b. Exterior Joints for which no other sealer is indicated.
 3. Joint Sealant: Silicone, S, NS, Class 25, NT.
 4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Non-staining silicone glazing sealant for exterior vertical non-traffic surfaces
1. Uses related to Joint Substrates: M, G, A and applicable substrates indicated O.
 - a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and wood.
 2. Joint Locations:
 - a. Glazing sealant
 - b. Exterior Joints for which no other sealer is indicated.
 3. Joint Sealant: Silicone, S, NS, Class 50, NT.

END OF SECTION 08 80 00

SECTION 09 05 61.13
MOISTURE VAPOR EMISSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 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.
- B. Before installation of flooring finishes over interior concrete slabs, District will have concrete floor slab moisture content tests performed by an independent laboratory to determine the level of vapor emissions in the concrete slabs, the pH level, and the amount of and location where moisture vapor emission control system will be applied. District will provide copies of the test results to the Architect, Project Inspector, and Contractor prior to the installation of the flooring finishes. If remedial action is indicated, it shall be performed by the Contractor in accordance with this section prior to the installation of the flooring finishes. This testing will occur before and after the moisture vapor emission control system is installed.
- C. Related Requirements:
 - 1. Section 01 22 00 "Unit Prices".
 - 2. Section 01 40 01 "Quality Requirements / District Laboratory".

1.3 UNIT PRICES

- A. Work of this Section is affected by Unit Prices.

1.4 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site a minimum of two weeks before Work in this Section is to commence..

1.5 DEFINITIONS

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

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product and system specified, including:
 - 1. Manufacturer's Specification.
 - 2. Manufacturer's Material Safety Data Sheets for moisture vapor emission control system proposed for use.
 - 3. Installation Instructions.
 - 4. Certification Requirements.
 - 5. Warranty Information.
 - 6. List of product use and performance history, for the same formulation and system design, listing reference sources. Similar projects shall have documented minimum initial vapor emission rates of 25 lbs per 1,000 sf per 24 hrs / 100% RH, and have resulted in maintained vapor reduction rate of less than 3 lbs per 1,000 sf per 24 hrs / 75% RH when tested in accordance with ASTM F 1869 and ASTM F 2170.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer and manufacturer.
 - 1. Installer Qualifications: Employ an installer currently certified by the Manufacturer, experienced in surface preparation and application of material, and subject to the inspection and control of the Manufacturer.
 - 2. Manufacturer Qualifications:
 - a. Minimum five (5) years of manufacturing the same moisture vapor emission control products without change of formulation or system design.
 - b. Manufacturer shall have independent lab test reports documenting performance per the following:
 - 1) ASTM E 96, Water Vapor Transmission (wet methods). Performance shall be documented by an independent testing laboratory at a minimum of 96% for vapor emission control compared to untreated ACI Committee 201 durable concrete.
 - 2) ASTM E 96 Permeance Rating: Product cannot exceed a 0.1 permeance rating.

- 3) ASTM F 3010: Two-component resin based membrane-forming mitigation system for use under resilient floor coverings. Conform to properties, application and performance of standard.
- 4) ASTM D 7234: Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
- 5) ASTM D 1308; Insensitivity to alkaline environment up to pH 14.
- 6) Certify acceptance and exposure to continuous topical exposure after final cure.
- 7) Reduce Calcium Chloride readings up to 25-lbs/1000 sq. ft. / 24 hrs. in one coat and perform as required with RH Probe readings of 100%.

- B. Sample Warranty: For manufacturer's warranty.
- C. Product Test Reports: For each MVE-control system.

1.8 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.
- B. Store products in ventilated, dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 deg. F. Protect from dampness, freezing, and direct sunlight.
- C. Handle product in a manner that shall prevent breakage of containers and damage to products.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Comply with MVE-control system manufacturer's written instructions for substrate and ambient temperatures, humidity, ventilation, and other conditions affecting system installation.
1. Store system components in a temperature-controlled environment and protected from weather and at ambient temperature of not less than 65 deg. F and not more than 85 deg. F at least 48 hours before use.
 2. Maintain ambient temperature and relative humidity in installation areas within range recommended in writing by MVE-control system manufacturer, but not less than 65 deg. F and not more than 85 deg. F and not less than 40 or more than 60 percent relative humidity, for 48 hours before installation, during installation, and for 48 hours after installation unless longer period is recommended in writing by manufacturer.

3. Install MVE-control systems where concrete surface temperatures will remain a minimum of 5 deg. F higher than the dew point for ambient temperature and relative humidity conditions in installation areas for 48 hours before installation, during installation, and for 48 hours after installation unless longer period is recommended in writing by manufacturer.
 4. Do not apply products to unprotected surfaces in wet weather or to substrates on which ice, frost, or water is visible.
 5. Products cannot be applied when Dew Point conditions exist. Consult the Manufacturer for specific guidelines concerning this condition.
 6. Allow continuous ventilation and indirect air movement at all times during application and curing process of the moisture vapor emission control systems.
- B. Protection: Protect products to prevent damage from active rain or topical water for a minimum period of 24 hours from time of application.

1.10 SCHEDULING

- A. Coordinate scheduling of testing and allow enough time for the testing, the installation of the moisture vapor emission control system, and the re-testing before installation of floor finishes.
- B. Allow the concrete slab to cure for not less than 28 days before testing. Consult with the District Construction Manager if an accelerated timetable is necessary.

1.11 WARRANTY

- A. General Warranty: The warranties specified in this Article shall not deprive the District of other rights the District 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.
- B. Standard Manufacturer's Warranty: Submit Manufacturer's standard written warranty, signed by moisture vapor emission control systems Manufacturer agreeing to promptly repair defects in materials or workmanship for the following warranty period:
1. Standard Manufacturer's Warranty: Manufacturer shall provide the District with its standard ten (10) year warranty at no additional cost.
 2. Installer's Warranty: Installer of moisture vapor emission control systems shall provide standard installation warranty for workmanship.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. MVE-Control System Capabilities: Capable of suppressing MVE without failure where installed on concrete that exhibits the following conditions:
 - 1. MVER: Maximum 25 lb of moisture vapor emission /1000 sq. ft. per 24 hrs. when tested according to ASTM F 1869.
 - 2. Relative Humidity: Maximum 100 percent when tested according to ASTM F 2170 using in situ probes.
- B. Water-Vapor Emission: Through MVE-control system, maximum 0.10 perm when tested according to ASTM E 96/E 96M.
- C. Tensile Bond Strength: For MVE-control system, greater than 1,000 psi at 28 days with failure in the concrete according to ASTM D 7234.

2.2 MVE-CONTROL SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide one of the following products:
 - 1. Allied Construction Technologies, Inc.; AC Tech 2170 Vapor Reduction Systems.
 - 2. KOSTER American Corporation. Koster; VAP 1 2000 System.
 - 3. MAPEI Corporation; Planiseal MVR.
 - 4. Or Equal.
- B. MVE-Control System: ASTM F 3010-qualified, fluid-applied, two-component, epoxy-resin, membrane-forming system; formulated for application on concrete substrates to reduce MVER to level required for installation of floor coverings indicated and acceptable to manufacturers of floor covering products indicated, including adhesives.
 - 1. ASTM E 96, Water Vapor Transmission (dry and wet methods) Performance shall be documented by an independent testing laboratory at a minimum 96% vapor emission reduction compared to untreated ACI Committee 201 durable concrete.
 - 2. ASTM D 1308; Insensitivity to alkaline environment up to pH 14.
 - 3. Long-term adhesion ASTM D 7234 Adhesion Properties after ASTM E 96 when applied onto damp, fresh, or old concrete with constant vapor emission.
 - 4. Substrate Primer: Provide MVE-control system manufacturer's concrete-substrate primer if required for system indicated by substrate conditions.
 - 5. Cementitious Underlayment Primer: If required for subsequent installation of cementitious underlayment products, provide MVE-control system manufacturer's primer to ensure adhesion of products to MVE-control system.

6. This system shall be applied to a properly prepared concrete surface. Testing showing a pH in excess of 10 and / or vapor emission levels as indicated in specified finish flooring Sections shall determine where this system is used and the coverage rates required. The moisture vapor emission control system shall reduce vapor emissions by a minimum of 96% after final cure.

2.3 ACCESSORIES

- A. Patching and Leveling Material: Moisture-, mildew-, and alkali-resistant product recommended in writing by MVE-control system manufacturer and with minimum of 4000-psi compressive strength after 28 days when tested according to ASTM C 109.
- B. Crack-Filling Material: Resin-based material recommended in writing by MVE-control system manufacturer for sealing concrete substrate crack repair.
- C. Cementitious Underlayment: Refer to Section 03 54 16 "Hydraulic Cement Underlayment".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. 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.
- B. Adhesion tests:
 1. Verify for acceptability the proper adhesion of flooring adhesives, coatings, and leveling compounds to the final moisture vapor emission control coating system. Contact moisture vapor emission control system Manufacturer's representative for recommendations.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
 1. Installation of system indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Clean all surfaces to receive moisture vapor emission control system. Shot blast all floors and clean surfaces with Shop Vac to remove all residue from the substrate. Remove all defective materials and foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form re-

lease agents, efflorescence, laitance, shot blast BBs, etc. Inform moisture vapor emission control system manufacturer if concrete additives like chlorides or other soluble compounds that can contaminate surfaces have been used in the concrete mix. Reinforcing fibers shall be burned off, scraped, and vacuumed. Acid etching is not allowed.

- B. Prior to moisture vapor emission control system installation, repair concrete including all cracks, expansion joints, control joints, and open surface honeycombs in accordance with moisture vapor emission control systems Manufacturer's recommendations.
- C. Verify that surfaces to be treated with moisture vapor emission control systems have not previously been treated with other materials such as underlayments, screeds, penetrating sealants, etc. If this is the case, consult with the Manufacturer's representative prior to application of moisture vapor emission control systems.
- D. Only a surface substrate that remains uncontaminated and sound is fit to receive a moisture vapor emission control system. Comply with all requirements as listed in Manufacturer's technical data information.
- E. Proper removal of contaminants can render surfaces too rough for certain flooring systems. Shot blast a small test area and verify with the flooring applicator that the surfaces are fit to receive the specified flooring system without the application of an underlayment on top of the moisture vapor emission control system.
- F. Use clean containers and mix thoroughly as per Manufacturer's requirements to obtain a homogeneous mixture. Use a low speed motor less than 400 rpm and a two bladed Jiffy mixing blade only. Do not aerate. Mix ratios are measured by volume.

3.3 DISTRICT TESTING

- A. Before installation of flooring finishes over interior concrete slabs, District will have concrete floor slab moisture content tests performed by an independent laboratory to determine the level of vapor emission in the concrete slabs, the pH level and the amount of and location where moisture vapor emission control system will be applied. If remedial action is indicated, perform such action in accordance with this section prior to the installation of the flooring finishes.
- B. After installation of the moisture vapor emission control system the District will repeat the testing procedure to confirm that the vapor emission and pH levels are adequate to receive the flooring finishes.

3.4 APPLICATION

- A. 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.
- B. Vapor Emission Level Reduction System:
1. Coverage by this system will be affected by the surface texture and porosity of the substrate as well as the measured level of moisture.
 2. Provide coverages relative to moisture vapor emissions as follows:
 - a. Spread moisture vapor emission control coating onto ICRI CSP-3 shot-blasted and prepared concrete surface at a rate of no greater than 130 sq. ft./gal. in one coat. Concrete prepared to CSP-3 coated at 130 sq. ft./gal. will yield an average dry mil thickness of no less than 12 mils (0.012-in.). Moisture vapor emission control coatings must be installed at a minimum dry mil thickness of no less than 12 mils (0.012) as less dry mil thickness will result in a higher permeance of the cured coating that will not meet the performance requirements of ASTM-F 3010 and Article 2.1 of this Specification.
 3. Apply moisture vapor emission control system in accordance with manufacturer's recommendations. Re-test after system has cured and before installing flooring finishes. Refer to additional application instructions in the Manufacturer's technical data sheets.
- C. Level and smooth surfaces as required by flooring manufacturer after shot blasting, surface preparation, and cured installation of the moisture vapor emission control system. Use an underlayment system manufactured, tested, and/or approved by the moisture vapor emission control system Manufacturer prior to installation. No underlayment system containing gypsum will be allowed. When water based adhesives are utilized in the floor covering installation, use previously approved underlayment systems with primer that is applied directly to the moisture vapor emission control system prior to the installation of the flooring system. Coordinate with the adhesive manufacturer for its minimum recommended thickness of cementitious underlayment to absorb excess moisture in the adhesive.
- D. Do not apply MVE-control system across substrate expansion, isolation, and other moving joints.
- E. Apply system, including component coats if any, in thickness recommended in writing by MVE-control system manufacturer for MVER indicated by preinstallation testing.
- F. Cure MVE-control system components according to manufacturer's written instructions. Prevent contamination or other damage during installation and curing processes.
- G. After curing, examine MVE-control system for surface deficiencies. Repair surface deficiencies according to manufacturer's written instructions.
- H. Install primer and cementitious underlayment over cured membrane if required to maintain manufacturer's warranty and in thickness required to maintain the warranty.

3.5 CLEANING AND 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.
- C. Clean all tools and equipment with xylene (or other cleaning agent as recommended by the manufacturer) immediately after use when applying the moisture vapor emission control level reduction system.
- D. Remove from the Project site all debris resulting from moisture vapor emission control system installation.
- E. Protect each coat during specified cure period from all traffic, water, and contaminants.

END OF SECTION 09 05 61.13

**SECTION 09 24 00
CEMENT PLASTERING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior vertical plasterwork (stucco).
 - 2. Exterior horizontal and nonvertical plasterwork (stucco).
 - 3. Interior vertical plasterwork.
 - 4. Interior horizontal and nonvertical plasterwork
- B. Related Requirements
 - 1. Section 09 91 13 "Exterior Painting"

1.3 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site a minimum of two weeks before the Work in this Section is to commence.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.
- C. Samples: For each type of factory-prepared finish coat and for each color and texture specified.
- D. Samples for Initial Selection: For each type of factory-prepared finish coat and for each color and texture specified.

- E. Samples for Verification: For each type of factory-prepared finish coat and for each color and texture specified, 12-by-12 inches, and prepared on rigid backing.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover, and keep them dry and protected against damage from weather, moisture, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.6 FIELD CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Exterior Plasterwork:
 - 1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
 - 2. Apply plaster when ambient temperature is greater than 40 deg F.
 - 3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.
- C. Interior Plasterwork: Maintain room temperatures at greater than 40 deg F for at least 48 hours before plaster application, and continuously during and after application.
 - 1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
 - 2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.
- D. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Where indicated, provide cement plaster assemblies identical to those of assemblies tested for fire resistance according to ASTM E 119 by a qualified testing agency.

2.2 METAL LATH

- A. Expanded-Metal Lath: ASTM C 847, cold-rolled carbon-steel sheet with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized-zinc coating.
 - 1. Diamond-Mesh Lath: Self-furring, 3.4 lb/sq. yd..
 - 2. Flat-Rib Lath: Rib depth of not more than 1/8-inch (3-mm), 3.4 lb/sq. yd..
- B. Wire-Fabric Lath:
 - 1. Welded-Wire Lath: ASTM C 933; self-furring, 1.95 lb/sq. yd..
 - 2. Woven-Wire Lath: ASTM C 1032; self-furring, with stiffener wire backing, 1.4 lb/sq. yd..
- C. Paper Backing: FS UU-B-790a, Type I, Grade D, Style 2 vapor-permeable paper.
 - 1. Provide paper-backed lath at exterior locations.
- D. No. 15 Asphalt-Saturated Organic Felt: ASTM D226, Type 1, unperforated.

2.3 ACCESSORIES

- A. General: Comply with ASTM C 1063, ASTM C 1861, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Metal Accessories:
 - 1. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A 653/A 653M, G60 zinc coating.
 - 2. External- (Outside-) Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized-zinc coating.
 - 3. Cornerbeads: Fabricated from zinc or zinc-coated (galvanized) steel.
 - a. Smallnose cornerbead with expanded flanges; use unless otherwise indicated.
 - 4. Casing Beads: Fabricated from zinc or zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
 - 5. Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.

2.4 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2-inch long, free of contaminants, manufactured for use in cement plaster.

- C. Bonding Compound: ASTM C 932.
- D. Fasteners for Attaching Metal Lath to Substrates: ASTM C 1861.
- E. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter unless otherwise indicated.
- F. Steel drill screws complying with ASTM C 1002 for fastening metal lath to wood or steel members less than 0.033-inch thick.
- G. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

2.5 PLASTER MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I.
 - 1. Color for Finish Coats: White (Plaster shall have integral color to match exterior color)
 - 2. Exterior Plaster Finish; To match existing exterior finish.
- B. Colorants for Job-Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color to match Architect's sample .
- C. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- D. Sand Aggregate: ASTM C 897.
 - 1. Color for Job-Mixed Finish Coats: In color matching Architect's sample.
- E. Perlite Aggregate: ASTM C 35.
- F. Ready-Mixed Finish-Coat Plaster: Mill-mixed Portland cement, aggregates, coloring agents, and proprietary ingredients.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Omega Products International.
 - b. LaHabra Stucco Solutions; Parex USA.
 - c. Merlex Stucco.
 - d. Or Equal.
 - 2. Color: As selected by Architect from manufacturer's full range

2.6 PLASTER MIXES

- A. General: Comply with ASTM C 926 for applications indicated.
 - 1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials.
- B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:
 - 1. Portland Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part Portland cement and 0 to 3/4 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - b. Brown Coat: For cementitious material, mix 1 part Portland cement and 0 to 3/4 parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
- C. Base-Coat Mixes for Use over Concrete: Single base (scratch) coat for two-coat plasterwork on low-absorption plaster bases as follows:
 - 1. Portland Cement Mix: For cementitious material, mix 1 part Portland cement and 0 to 3/4 part lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
- D. Base-Coat Mixes for Use over Concrete: Single base (scratch) coat for two-coat plasterwork on high-absorption plaster bases as follows:
 - 1. Portland Cement Mix: For cementitious material, mix 1 part Portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
- E. Job-Mixed Finish-Coat Mixes:
 - 1. Portland Cement Mix: For cementitious materials, mix 1 part Portland cement and 3/4 to 1-1/2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.
- F. Factory-Prepared Finish-Coat Mixes: For ready-mixed finish-coat plasters, comply with manufacturer's written instructions.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare smooth, solid substrates for plaster according to ASTM C 926.

3.3 INSTALLATION, GENERAL

- A. Fire-Resistance-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated on Drawings.
- B. Sound-Attenuation Blankets: Where required, install blankets before installing lath unless blankets are readily installed after lath has been installed on one side.

3.4 INSTALLING METAL LATH

- A. Metal Lath: Install according to ASTM C 1063.
 - 1. Partition Framing and Vertical Furring: Install welded-wire lath.
 - 2. On Solid Surfaces, Not Otherwise Furred: Install self-furring, welded-wire lath.

3.5 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
- B. Reinforcement for External (Outside) Corners:
 - 1. Install cornerbead at exterior locations.
 - 2. Install cornerbead at interior locations.
- C. Control Joints: Locate as approved by Architect for visual effect and as follows:
 - 1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:

- a. Vertical Surfaces: 144 sq. ft.
 - b. Horizontal and Other Nonvertical Surfaces: 100 sq. ft.
2. At distances between control joints of not greater than 18 feet o.c.
 3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
 4. Where control joints occur in surface of construction directly behind plaster.
 5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.6 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
 1. Do not deviate more than plus or minus 1/4-inch in 10 feet from a true plane in finished plaster surfaces when measured by a 10-foot straightedge placed on surface.
 2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
 3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Bonding Compound: Apply on concrete substrates for direct application of plaster.
- C. Walls; Base-Coat Mixes for Use over Metal Lath: For scratch and brown coats, for three-coat plasterwork with 3/4-inch total thickness, as follows:
 1. Portland cement mixes.
- D. Walls; Base-Coat Mix: For base (scratch) coat, for two-coat plasterwork and having 1/4-inch thickness on concrete, as follows:
 1. Portland cement mix.
- E. Ceilings; Base-Coat Mix: For base (scratch) coat, for two-coat plasterwork and having 1/4-inch thickness on concrete, as follows:
 1. Portland cement mix.
- F. Plaster Finish Coats: Apply to match existing finish coat.
- G. Concealed Exterior Plasterwork: Where plaster application is used as a base for adhered finishes, omit finish coat.
- H. Concealed Interior Plasterwork:

1. Where plaster application is concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.
2. Where plaster application is concealed above suspended ceilings and in similar locations, omit finish coat.
3. Where plaster application is used as a base for adhesive application of tile and similar finishes, omit finish coat.

3.7 PLASTER REPAIRS

- A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.8 CLEANING AND PROTECTION

- A. Remove temporary protection and enclosure of other work after plastering is complete. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09 24 00

SECTION 09 29 00**GYPSUM BOARD****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Tile backing panels.
 - 3. Texture finishes.
- B. Related Requirements:
 - 1. Section 09 22 16 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
 - 2. Section 09 30 13 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
 - 2. Textured Finishes: 12 inch X 12 inch for each textured finish indicated and on same backing indicated for Work. (texture to match existing)
- C. Samples for Initial Selection: For each type of trim accessory and textured finish indicated.
- D. Samples for Verification: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
 - 2. Textured Finishes: 12 inch X 12 inch for each textured finish indicated and on same backing indicated for Work.

GYPSUM BOARD**09 29 00 - 1****DEHESA SCHOOL MODERNIZATION**

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- 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.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Suspended gypsum board ceiling systems shall comply with DSA IR-25-3.13.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. National Gypsum Company.
 - b. PABCO Gypsum.
 - c. United States Gypsum Company.
 - d. Or Equal.
 2. Thickness: 5/8-inch and 1/2-inch where occurs.
 3. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

2.4 TILE BACKING/ EXTERIOR WALL FRAMING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, Type A in maximum lengths available to minimize end-to-end butt joints with manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Building Products.
 - b. FinPan, Inc.
 - c. United States Gypsum Company.
 - d. Or Equal.
 2. Thickness: 5/8-inch.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- B. Fiber-Cement Backer Board: ASTM C 1288, in maximum lengths available to minimize end-to-end butt joints.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allura.
 - b. CertainTeed Corporation.
 - c. James Hardie Building Products, Inc. (Basis of Design)
 - d. Or Equal.
 2. Thickness: 5/16 inch or as indicated.
 3. Bacteria and Fungus Resistance: ASTM G22

2.5 TRIM ACCESSORIES**A. Interior Trim: ASTM C 1047.**

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
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 C 475/C 475M.****B. Joint Tape:**

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

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 drying-type, all-purpose compound.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.
2. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.7 AUXILIARY MATERIALS**A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.**

- B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033- to 0.112-inch thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Isolation Strip at Exterior Walls:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
- D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hilti, Inc.
 - b. Pecora Corporation.
 - c. United States Gypsum Company.
 - d. Or Equal.
- F. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."

2.8 TEXTURE FINISHES

- A. Primer: As recommended by textured finish manufacturer.
- B. Aggregate Finish: Water-based, job-mixed, aggregated, drying-type texture finish for spray application.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. National Gypsum Company.
 - b. PABCO Gypsum.
 - c. United States Gypsum Company.
 - d. Or Equal.

2. Texture: (to match existing wall finish).
- C. Non-Aggregate Finish: Premixed, vinyl texture finish for spray application.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. National Gypsum Company.
 - b. PABCO Gypsum.
 - c. United States Gypsum Company.
 - d. Or Equal.
 2. Texture: (Match existing).

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- 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. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. 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.
- K. 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. Type X: Where gypsum board is indicated (through-out).
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels perpendicular to framing unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

- a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
- B. Water-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.
- C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners unless otherwise indicated.
 2. Bullnose Bead: Use at outside corners or where indicated.
 3. LC-Bead: Use at exposed panel edges.
 4. L-Bead: Use where indicated.
 5. U-Bead: Use at exposed panel edges.

6. Curved-Edge Cornerbead: Use at curved openings.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, 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. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile.
 3. Level 3: Where indicated on Drawings.
 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 APPLYING TEXTURE FINISHES (Texture to Match Existing)

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written instructions.

3.8 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 discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 13

CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: (Tile Repairs for new fixture locations)
 - 1. Porcelain tile.
 - 2. Glazed wall tile.
 - 3. Waterproof membrane for thinset applications.
 - 4. Crack isolation membrane (for isolation of existing in-plane cracks).
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 2. Section 09 29 00 "Gypsum Board" for tile backing panels.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site a minimum of two weeks before work in this Section commences.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

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

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- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
- D. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required
 - 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
 - 3. Full-size units of each type of trim and accessory for each color and finish required.
 - 4. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product.
- D. Product Test Reports: For tile-setting and -grouting products and certified porcelain tile.
- E. Grout and mortar manufacturers to warrant product suitability in writing for above-ground installation.
- F. Letter of acceptance of tile substrate by the tile installer.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.
 - 2. Installer has a minimum of 6 years experience in K-12 public school.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.9 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC), 2022 edition.
- B. Ceramic Tile Flooring demonstrating a coefficient of friction of at least 0.6 per ASTM C1028 shall be accepted as meeting the intent of slip resistance. Ceramic tile flooring shall be stable, firm and slip resistant complying with CBC Section 11B-302.1.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.11 EXTRA MATERIALS

- A. Supply an amount equal to 3 percent of each style, size color and surface finish of the tile specified and called for in the documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
 - 2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
 - 1. Thresholds.

2. Waterproof membrane.
3. Crack isolation membrane.
4. Metal edge strips.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 1. Provide tile complying with Standard grade requirements.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For Factory-mounted tile, provide back or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 1. Where tile is indicated for installation on exteriors or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.3 TILE PRODUCTS

- A. Ceramic Tiles
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Match existing. Confirm selection with Architect.
 - a. Daltile
 - b. American Olean
 - c. Crossville Ceramics Company
- B. Provide impervious ceramic tile with a monolithic body pressed from porcelain particles, evenly colored throughout, of sizes as indicated, including special shapes required; colors shall be from manufacturer's standard pallet and as indicated in the Finish Schedule.
- C. Floor Tiles: For tiles to be used on floors produce a coefficient of friction of 0.60, or higher (0.80 in wet areas) in accordance with pertinent provisions of ASTM C1028. DCOF Acutest of .42 wet.
- D. Tiles for walls to be used in potentially wet areas, walls are not to be backed with paper material.

- E. Ceramic Wall Tile: Per Finish Schedule; Color and pattern to match existing.
- F. Interior Wall Tile: Per Finish Schedule; Color and pattern to match existing.
- G. Ceramic Floor and Base Tile: Per Finish Schedule, Color and pattern to match existing.

2.4 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, selected from the following that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Dow Chemical Company (The).
 - b. Lianda Corporation.
 - c. Noble Company (The).
 - d. Or Equal.
 - 2. Nominal Thickness: 0.040 inch.
- C. Latex-Portland Cement Waterproof Mortar: Flexible, waterproof mortar consisting of cement-based mix and latex additive.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Boiardi Products Corporation; a QEP company.
 - b. C-Cure.
 - c. MAPEI Corporation.
 - d. Or Equal.

2.5 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Composite Corporation.

- b. Noble Company (The).
- c. Schluter Systems L.P.
- d. Or Equal.

2.6 SETTING MATERIALS

A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

- 1. Cleavage Membrane: Asphalt felt, ASTM D 226/D 226M, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
- 2. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185/A 185M and ASTM A 82/A 82M, except for minimum wire size.
- 3. Expanded Metal Lath: Diamond-mesh lath complying with ASTM C 847.
 - a. Base Metal and Finish for Interior Applications: Uncoated or zinc-coated (galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.
 - b. Base Metal and Finish for Exterior Applications: Zinc-coated (galvanized) steel sheet.
 - c. Configuration over Studs and Furring: Flat.
 - d. Configuration over Solid Surfaces: Self-furring.
 - e. Weight: 3.4 lb/sq. yd.
- 4. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed Portland cement and aggregate mortar bed.

B. Standard Dry-Set Mortar (Thinset): ANSI A118.1.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C-Cure.
 - b. Custom Building Products.
 - c. Laticrete International, Inc.
 - d. Or Equal.
- 2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.

C. Modified Dry-Set Mortar (Thinset): ANSI A118.4.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C-Cure.
 - b. Custom Building Products.
 - c. Laticrete International, Inc.
 - d. Or Equal.

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.7 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Standard Cement Grout: ANSI A118.6.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C-Cure.
 - b. Custom Building Products.
 - c. Laticrete International Inc.
 - d. Or Equal.
- C. High-Performance Tile Grout: ANSI A118.7.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C-Cure.
 - b. Custom Building Products.
 - c. Laticrete International Inc.
 - d. Or Equal.
 2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
 3. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
- D. Water-Cleanable Epoxy Grout: ANSI A118.3. (For Use in Wet Areas/Restrooms)
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C-Cure.
 - b. Custom Building Products.
 - c. Laticrete International Inc.
 - d. Or Equal.

2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, Portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D 4397, 15 mil (min) thick.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- D. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bonsal American, an Oldcastle company.
 - b. Custom Building Products.
 - c. TEC; H.B. Fuller Construction Products Inc.
 - d. Or Equal.
- E. Grout Sealer: Anti-microbial, sodium silicate-based grout sealant:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DuPont.
 - b. Ashland Chemical Co.
 - c. Porter Paints.
 - d. Or Equal.

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with the District Construction Manager.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a concrete grinder, drum sander, or a polishing machine with a heavy-duty wire brush.
- C. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- D. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

- A. Comply with the Tile Council of North America's (TCNA's) "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods indicated on Drawings and in specifications. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. Back Buttering: For the following installations, follow procedures in the A108 series of tile installation standards for providing 100 percent mortar coverage:
 - a. Tile floors in wet areas
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Install metal lath and scratch coat to walls to comply with ANSI A108.1A, Section 4.1.
- E. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- F. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- G. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- H. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Pressed Floor Tile: 1/4 inch.
 - 2. Glazed Wall Tile: 1/8 inch.
 - 3. Porcelain Tile: 1/4 inch .

4. Unglazed Wall Tile: 1/16 inch.

- I. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- J. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- K. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
- L. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.5 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
- B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other

surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

- C. Grout Sealer: Apply grout sealer to all grout in accordance with manufacturer's recommendations.
- D. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective work.

3.7 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Comply with the Tile Council of North America's (TCNA's) "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods indicated on Drawings and in specifications

LOCATION	SUBSTRATE	TCNA METHOD
Interior mortar-set paver tile or ceramic tile over slab-on-grade	cement mortar, bonded	F111
Interior mortar set ceramic tile over slab-on-grade at toilet rooms	concrete	F121
Interior thin-set paver tile over slab-on-grade	concrete	F113
Interior walls, mortar set	cement mortar, plywood, wood studs	W221
Interior tile walls, mortar set	cement mortar wood studs	W231
Interior tile walls, mortar set	cement mortar metal studs	W241
Interior walls, thin-set	water resistant gypsum wallboard	W243
Interior walls, thin-set	cementitious backer board metal studs	W244C

END OF SECTION 09 30 13

SECTION 09 51 13
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for ceilings.

1.3 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site a minimum of two weeks before work in this Section commences.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- C. Samples for Initial Selection: For components with factory-applied color finishes.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch-square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch-long Samples of each type, finish, and color.
 - 3. Clips: Full-size hold-down, impact and seismic clips.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
 2. Structural members to which suspension systems will be attached.
 3. Size and location of initial access modules for acoustical panels.
 4. Method of attaching hangers to building structure.
 5. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Diffusers.
 - c. Grilles.
 - d. Speakers.
 - e. Sprinklers.
 - f. Access panels.
 - g. Perimeter moldings.
 6. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
 7. Minimum Drawing Scale: 1/4 inch = 1 foot (1:48) .
- B. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) current edition and the Division of State Architect (DSA) Interpretation of Regulations 25-2. including:
1. Wires.
 2. Closure angles.
 3. Grid members.
 4. Compression struts.
 5. Anchors.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them 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. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to the ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 0-25. Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 50 or less.
- C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 ACOUSTICAL PANELS (ACT-1)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc./ Armstrong Ultima High NRC Beveled Tegular 1944 (NRC .80) (**Basis of Design**)
 - 2. CertainTeed Corporation.
 - 3. United States Gypsum Company.

SPECIFICATION

NO. 22 0400

- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Color: White
- D. Light Reflectance (LR): Not less than 0.80.
- E. Noise Reduction Coefficient (NRC): Not less than 0.80.
- F. Ceiling Attenuation Class (CAC): Not less than 35.
- G. Edge/Joint Detail: Beveled Tegalur or as indicated
- H. Thickness: 15/16-inch
- I. Modular Size: 24"x 48"x 7/8"
- J. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 ACOUSTICAL PANELS (ACT-2)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc./ Armstrong Ultima High NRC Beveled Tegalur 1433 (NRC .80) (**Basis of Design**)
 - 2. CertainTeed Corporation.
 - 3. United States Gypsum Company.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide fire-resistance-rated panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type IV, mineral base with washable vinyl membrane-faced overlay; Form 2, water felted.
 - 2. Pattern: E (lightly textured).
- D. Color: White

- E. Light Reflectance (LR): Not less than 0.80.
- F. Noise Reduction Class (NRC): Not less than 0.80.
- G. Ceiling Attenuation Class (CAC): Not less than 35.
- H. Edge/Joint Detail: Beveled Tegular or as indicated
- I. Thickness: 15/16-inch
- J. Modular Size: 24"x 60"x 7/8"
- K. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.5 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc. **(Basis of Design)**
 - a. Prelude XL 15/16" Heavy Duty System
 - b. Main Runner – Prelude XL- 7301 Heavy Duty
 - c. Cross runner: XL 7341, XL 7357
 - c. Evaluation Report: 1308
 - d. Seismic Clip: Berc-2, ESR-1308
 - 2. Chicago Metallic Corporation.
 - 3. United States Gypsum Company.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.
 - 1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C 635/C 635M.
- 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 according to ASTM A 653/A 653M, not less than 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: As indicated
3. Face Design: Flat, flush.
4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: White, manufacturer's factory finish.

2.6 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.135-inch dimension diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 7/8-inch wide; formed with 0.04-inch-thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch-diameter bolts.
- F. Hold-Down Clips: Manufacturer's standard hold-down.
- G. Impact Clips: Manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
- H. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.
- I. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

2.7 METAL EDGE MOLDINGS AND TRIM (Basis of design)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Armstrong World Industries, Inc.
 2. CertainTeed Corporation.
 3. United States Gypsum Company.
 4. .

- B. 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. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.8 ACOUSTICAL SEALANT

- A. Acoustical Sealant: As specified in Section 07 92 19 "Acoustical Joint Sealants."

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

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to the CBC, DSA, manufacturer's written instructions, and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8-inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels 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. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 - 3. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
 - 4. 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.
 - 5. Install hold-down 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.
 - 6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8-inch in 12 feet, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8-inch in 12 feet, non-cumulative.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: District will engage a qualified special inspector to perform tests and inspections and prepare test reports the following:
 - 1. Compliance of seismic design.
- B. Testing Agency: District will engage a qualified testing agency to perform tests and inspections and prepare test reports.
- C. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.

3.6 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, panels, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace panels and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

**SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Thermoset-rubber base.
 - 2. Aluminum wall base
- B. Related Requirements:
 - 1. Section 02 41 19 "Selective Demolition" for removing existing floor coverings.
 - 2. Section 09 65 19 "Resilient Tile Flooring"
 - 3. Section 09 05 61.13 "Moisture Vapor Emission Control".

1.3 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. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

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 temperature or more than 95 deg F temperature.
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 QUALITY ASSURANCE

- A. District will have concrete floor slab moisture content tests performed by an independent laboratory. District will submit copies of the test results to the Architect, Project Inspector, and Contractor prior to the installation of resilient base and accessories. If remedial action is indicated, perform in accordance with Section 09 05 61.13 "Moisture Vapor Emission Control" prior to the installation of resilient base and accessories.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Burke Mercer Flooring Products; a division of Burke Industries Inc.
 - 2. Tarkett : Johnsonite **(Basis of Design)**
 - 3. Roppe Corporation, USA.
 - 4. Or Equal.
- B. Product Standard: ASTM F 1861, Type TS rubber, Group I (solid, homogeneous).

1. Style and Location:
 - a. Style A, Straight: Provide in areas with carpet
 - b. Style B, Cove: Provide in areas with resilient flooring.
 - C. Thickness: 0.125-inch min.
 - D. Coils preferred
 - E. Height: As indicated on Drawings.
 - F. Lengths: Coils in manufacturer's standard length.
 - G. Outside Corners: Preformed.
 - H. Inside Corners: Preformed.
 - I. Colors: 08 Icicle
- 2.2 METAL BASE MOLDING (Library Desk)
- A. Manufacturer: Diamond Life Gear (Basis of Design)
 - B. Material; Aluminum of manufacturers standard thickness
 1. Height: 6 inches
 2. Finish: Light Brush anodized aluminum
 3. Detail: No cove or cap detail
 4. Inside and Outside corners: to be prefabricated.
- 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 resilient-product manufacturer for applications indicated.
 - B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
 1. VOC Content: Adhesives shall comply with the testing and product requirements of San Diego Air Pollution Control District Rule 67.0 "Architectural Coatings" and Rule 67.21 "Adhesive Material Application Operations."
 - C. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

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. Concrete Substrates: Prepare horizontal surfaces according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient base and accessory manufacturer. Do not use solvents.
 - 3. Verify that finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - a. District will test concrete substrate for pH and moisture vapor emission level. Concrete must have a pH less than 10 and a moisture vapor emission level less than 3 lbs per 1,000 sf per 24 hours. If these levels are exceeded, a moisture vapor emission control system must be used before installation of resilient base and accessories.
 - 4. If moisture vapor emission control system is not required, grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.
 - 5. If moisture vapor emission control system is required, prepare substrate in accordance with Section 09 05 61.13 "Moisture Vapor Emission Control."
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

- D. 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.
- E. 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 Exterior Corners: Install preformed exterior corners before installing straight pieces.
- H. Job-Formed Inside Corners:
 - 1. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Miter or cope corners to minimize open joints.

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 09 65 13

SECTION 09 65 19
RESILIENT TILE FLOORING

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid vinyl floor tile.
 - 2. Vinyl composition floor tile.
- B. Related Requirements:
 - 1. Section 02 41 19 "Selective Demolition" for removing existing floor coverings.
 - 2. Section 09 65 13 "Resilient Base and Accessories"
 - 3. Section 09 05 61.13 "Moisture Vapor Emission Control".

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency.
- B. Shop Drawings: For each type of resilient sheet flooring.
 - 1. Include sheet flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 2. Show details of special patterns.
 - 3. Show edge accessory details.
- C. Samples: Full-size units of each color, texture, and pattern of floor tile required.
- D. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.
- B. District will have concrete floor slab moisture content tests performed by an independent laboratory. District will submit copies of the test results to the Architect, Project Inspector, and Contractor prior to the installation of resilient tile flooring. If remedial action is indicated, perform in accordance with Section 09 05 61.13 "Moisture Vapor Emission Control" prior to the installation of resilient tile flooring.

1.7 WARRANTY

- A. Manufacturer's Warranty: Submit manufacturer's standard warranty document.
 - 1. Warranty Period: Five (5) year limited warranty commencing on Date of Substantial Completion.

1.8 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) current edition.
- B. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and CBC Section 11B-302.1. Floors shall be stable, firm and slip-resistant.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile 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. Store floor tiles on flat surfaces.

1.10 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F temperature or more than 95 deg F temperature, in spaces to receive floor tile 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 temperature or more than 95 deg F temperature.
- C. Do not install resilient sheet flooring over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by sheet flooring manufacturer.
- D. Close spaces to traffic during floor tile installation.
- E. Close spaces to traffic for 48 hours after floor tile installation.
- F. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile 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 W/sq. cm according to NFPA 253.
 - 2. Smoke Density: Not more than 450 according to ASTM E 662.

2.2 SOLID VINYL FLOOR TILE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mannington Commercial (**Basis of Design**) LVT as indicated on Finish Schedule and Finish Plans.
 - a. Product: Amtico Signature Collection / Wood

2. Armstrong World Industries, Inc.
 3. Forbo Flooring Systems.
 4. Johnsonite; A Tarkett Company.
- B. Tile Standard: ASTM F 1700.
1. Class: Class III, B.
- C. Thickness: 0.098 inch.
- D. Size: 7.25" x 48"
- E. Colors and Patterns: Maple
- F. Wear Surface: Mannington Commercial, Quantum Guard Elite, 40 Mil.

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 floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Floor Polish: Provide minimum five coats of protective, liquid floor-polish products recommended by floor tile manufacturer.

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 floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

- B. Concrete Substrates: Prepare according to ASTM F 710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient tile flooring manufacturer. Do not use solvents.
 3. Verify that finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - a. District will test concrete substrate for pH and moisture vapor emission level. Concrete must have a pH and a moisture vapor emission level per flooring manufacturer's recommendation. If these levels are exceeded, a moisture vapor emission control system must be used before installation of resilient tile flooring.
 4. If moisture vapor emission control system is not required, grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.
 5. If moisture vapor emission control system is required, prepare substrate in accordance with Section 09 05 61.13 "Moisture Vapor Emission Control."
- C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- E. Do not install floor tiles 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 floor tile and installation materials into spaces where they will be installed.
- F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
1. Lay tiles in pattern indicated.

- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. If tile color varies slightly by container, mix all tile product together prior to installing to avoid large areas of color variation. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, accessible cabinets open to the floor, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles 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.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for protecting installed resilient floor tile during installation and construction. At a minimum:
 - 1. Protection from general construction: Plain, undyed kraft paper
 - 2. Protection when moving heavy loads across installed flooring on casters or dollies: ¼ inch thick minimum underlayment panels, such as plywood or hardboard.
- B. Comply with manufacturer's written instructions for cleaning resilient floor tile.
- C. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- D. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- E. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 68 13**TILE CARPETING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes:
 - 1. Modular carpet tile.
 - 2. Walk-off-mats
- B. Related Requirements: Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.
 - 1. Section 02 41 19 "Selective Demolition" for removing existing floor coverings.
 - 2. Section 09 65 13 "Resilient Base and Accessories"
 - 3. Section 09 65 19 "Resilient Tile Flooring"
 - 4. Section 09 05 61.13 "Moisture Vapor Emission Control" for preparation of concrete floors.

1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site a minimum of two weeks before the Work in this Section commences. The Agenda will include but not be limited to the following:
 - 1. Review methods and procedures related to carpet tile installation, including:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

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

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1. Include manufacturer's written data on physical characteristics, durability, closed cell vinyl cushion backing, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.
3. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency.

B. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples for Initial Selection: For each type of carpet tile.

1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.

D. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data:** For Installer.
- B. Product Test Reports:** For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty.**

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level, or who can demonstrate compliance with its certification program requirements.
- B. District will have concrete floor slab moisture content tests performed by an independent laboratory. District will provide copies of the test results to the Architect, Project Inspector, and Contractor prior to the installation of tile carpeting. If remedial action is indicated, perform in accordance with Section 09 05 61.13 "Moisture Vapor Emission Control" prior to the installation of tile carpeting.
- C. Provide Manufacturer's representative to assist in project start-up and to inspect installation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."

1.9 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive, and have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

- A. Manufacturer's standard non-prorated warranty in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include:
 - a. More than 15 percent edge raveling, snags, zippering and runs.
 - b. Dimensional instability.
 - c. Excess static discharge. Excessive static discharge means more than 3.0 kilovolts when tested per AATCC 134 at a relative humidity of 20% and room temperature of 70% F.
 - d. Watermark on any product not 100% loop construction. Watermark means an apparent color difference between areas of the same carpet due to permanent pile reversal with random differences in pile lay direction and differences in the amount of light reflected by carpet fibers.
 - e. Resiliency Loss of Backing: More than 10-percent loss of backing resiliency.
 - f. Loss of tuft-bind strength.
 - g. Loss of face fiber.
 - h. Delamination.
 - 3. Chair pads are not required for carpet warranty coverage.
 - 4. All carpet warranties to be sole responsibility of the Manufacturer. Second source warranties or warranties that involve parties other than the Manufacturer are unacceptable.
 - 5. Warranty Period: Lifetime limited warranty.
 - 6. Warranty shall be signed by a company representative.

PART 2 - PRODUCTS**2.1 REGULATORY REQUIREMENTS**

- A. Comply with the California Building Code (CBC) current edition.
 - 1. Carpet shall be securely attached and shall have a firm cushion, pad, or backing or no cushion or pad. It shall have a level loop, textured loop, level cut pile, or level cut/uncut pile texture. Pile height shall be 1/2" maximum.
 - 2. Exposed edges shall be fastened to floor surfaces and shall have trim on the entire length. Carpet edges shall comply with CBC Section 11B-303.
- B. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and CBC Section 11B-302.2.

2.2 VINYL CUSHIONED TUFTED TEXTILE CARPET TILE (Refer to Finish Schedule)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Shaw Contract. **(Basis of Design)**
 - 2. Bentley Prince Street, Inc.
 - 3. Mannington.
 - 4. Mohawk Industries, Inc.
- B. Color: As selected by Architect from manufacturer's full range.
- C. Pattern: As selected by Architect from manufacturer's full range.
- D. Fiber Content: 100-percent nylon 6.
- E. Fiber Type: 100-percent branded nylon.
- F. Pile Characteristic: Multi Level Pattern Cut-loop
- G. Density Factor: 10065 oz./cu. yd.
- H. Dye Method: 100% Solution dyed.
- I. Pile Height Average: 0.093-inch.
- J. Stitches: Minimum 9.0 stitches per inch.
- K. Gage: Minimum 1/12 inch.
- L. Primary Backing: 100-percent non-woven synthetic fiber.
- M. Secondary Backing: Ecoworx Tile.
- N. Size: 25-by-29 inches
- O. Applied Treatments:
 - 1. Soil-Resistance Treatment: 100-percent branded soil protection.
 - 2. Antimicrobial Treatment: No antimicrobials added to product ASTM E2471-05.
- P. Performance Characteristics:
 - 1. Texture Appearance Retention Rating (TARR): Heavy traffic, 3.0 minimum according to ASTM D 7330.
 - 2. Critical Radiant Flux Classification: Class 1, not less than 0.45 W/sq. cm according to NFPA 253.
 - 3. Smoke Density: Not more than 450 according to ASTM E 662.

4. Dry Breaking Strength: Not less than 100 lbf according to ASTM D 2646.
5. Tuft Bind: Not less than 10 lbf according to ASTM D 1335.
6. Delamination: No delamination according to ASTM D 3936.
7. Dimensional Tolerance: Within 1/32-inch of specified size dimensions, as determined by physical measurement.
8. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
9. Noise Reduction Coefficient (NRC): 0.15 according to ASTM C 423.F
10. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
11. Electrostatic Propensity: Less than 3.0 kV according to AATCC 134.
12. Moisture penetration by impact at 10 psi: No penetration of backing and seam after 10,000 impacts.
13. Static Coefficient of Friction: Minimum 0.60, passes ADA requirements for Accessible routes per ASTM C-1028.
14. Compression Deflection: Minimum 7 lbs./sq. inch at 25%; Maximum 25 lbs./sq. inch at 25%.
15. Total recycle content: Pre-Consumer 62%; Post-Consumer)%

2.3 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.
 1. VOC Content: Adhesives shall comply with the testing and product requirements of San Diego Air Pollution Control District Rule 67.0 "Architectural Coatings", and Rule 67.21 "Adhesive Material Application Operations."
 2. Recommended Adhesive: LokWorx+ Carpet Tile Adhesive, LokWorx+ Multi-Use Adhesive , LokDots, LokWorx Adhesive Tabs, Shaw 3800 or LokWorx Carpet Tile Adhesive.
- C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements for installation over existing concrete slab and required prep work, and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8-inch wide or wider, and protrusions more than 1/32-inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by tile carpeting manufacturer. Do not use solvents.
 - 3. Verify that finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - a. District will test concrete substrate for pH and moisture vapor emission level. Concrete must have a pH less than 10 and a moisture vapor emission level less than 7 lbs per 1,000 sf per 24 hours. If these levels are exceeded, a moisture vapor emission control system must be used before installation of tile carpeting.

4. If moisture vapor emission control system is not required, grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.
 5. If moisture vapor emission control system is required, prepare substrate in accordance with Section 09 05 61.13 "Moisture Vapor Emission Control."
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns indicated on Drawings
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 2. Remove yarns that protrude from carpet tile surface.
 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

**SECTION 09 72 60
TACKABLE WALLCOVERING**

PART 1 - GENERAL**1.1 RELATED DOCUMENT**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient cork/linoleum tackable wallcovering.
 - 2. Accessories.
- B. Related Divisions:
 - 1. Division 09 91 23 Interior Painting: Priming for wallcoverings.

1.3 ACTION SUBMITTALS

- A. Comply with Division 01 33 00.
- B. Product data indicating compliance with specified requirements.
- C. Product Data for installation adhesives, documentation including printed statement of VOC content.
- D. Manufacturer's Installation Instructions.
- E. Samples:
 - 1. 7- inch by 9-inch samples of each type of tackable wallcovering material specified
 - 2. Panel Edge: 12-inch- (300-mm-) long Sample(s) showing each edge profile, corner, and finish.
 - 3. Core Material: 12-inch- (300-mm-) square Sample at corner.
 - 4. Mounting Devices: Full-size Samples.
- F. Shop Drawings: For tackable wall covering. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge and core materials.
 - 1. Include elevations showing panel sizes and direction of fabric weave and pattern matching.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Provide Coordination Drawings (Interior Elevations and other details) drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

SPECIFICATIONS

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1. Electrical outlets, switches, and thermostats.
 2. Items penetrating or covered by tackable wall covering including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Alarms.
 - e. Sprinklers.
 - f. Access panels.
 - g. Thermostats
 3. Show operation of hinged and sliding components covered by or adjacent to tackable wallcovering.
- B. Product Certificates: For each type of tackable wallcovering from manufacturer.

1.5 QUALITY ASSURANCE

- A. Surface Burning Characteristics Classification: Provide materials that meet classification ratings below:
1. ASTM E84 (Flame Spread and Smoke Developed).
 - a. Flame Spread Index: 25 or less
 - b. Smoke Developed Index: 450 or less
- B. Fire Growth Contribution: Meeting acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265.
- C. Single Source Responsibility: Obtain tackable wallcovering system components from a single source.
- D. Deliver materials in original factory packaging, labeled with manufacturer, brand name, size, color, and lot number.
- E. Store materials in original, undamaged packaging inside a well-ventilated area protected from weather, moisture, soiling, and extreme temperatures.
1. Maintain room temperature within the storage area at not less than 68 degrees Fahrenheit (20 degrees Celsius) during the period materials are stored.
- F. Mock-ups: Prepare mock-ups for architect's review and to establish requirements for seaming and finish trim.
1. Correct areas, modify method of application/installation, or adjust finish texture as directed by architect to comply with specified requirements.
 2. Maintain mock-ups accessible to serve as a standard of quality.
 3. Install sample panel of each type of wallcovering specified.
 4. Install panels in areas designated by architect.
- G. Pre-installation Conference: Conduct conference at project site a minimum of two weeks prior to commencement of work in this section.

1.6 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code, (CBC) current edition

1.7 PROJECT CONDITIONS

Maintain ambient temperature within the building at not less than 68 degrees Fahrenheit (20 degrees Celsius) for a minimum of seventy-two hours prior to beginning of installation.

1. Do not install tackable wallcovering until the space is enclosed and weatherproof.
2. Do not install tackable wallcovering until the temperature is stabilized and permanent lighting is in place.

1.8 MAINTENANCE

- A. Maintenance Instructions: Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fabric-wrapped wall panels that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Fabric sagging, distorting, or releasing from panel edge or corners.
 - b. Warping of core.
2. Warranty Period: Five years from date of Substantial Completion.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Comply with fabric and fabric-wrapped, wall panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.11 PROJECT CONDITIONS:

- A. Environmental Limitations: Do not install fabric-wrapped wall panels until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install fabric-wrapped wall panels until a permanent level of lighting is provided on surfaces to receive fabric-wrapped wall panels.
- C. Air-Quality Limitations: Protect fabric-wrapped wall panels from exposure to airborne odors such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify locations of fabric-wrapped wall panels and actual dimensions of openings and penetrations by field measurements before fabrication.

TACKABLE WALLCOVERING**09 72 60 – 3****DEHESA SCHOOL MODERNIZATION**

PART 2 - PRODUCTS**2.1 PRODUCTS**

- A. Basis of Design Product: Walltalkers® Tac-Wall®: Uni-color resilient homogeneous tackable linoleum surface consisting of linseed oil, granulated cork, rosin binders, and dry pigments calendered onto natural burlap backing. Color shall extend through thickness of material.
 - 1. Colors: As indicated on Drawings.
 - 2. Size: As indicated on Drawings.
- B. Comparable products by one of the following may be acceptable:
 - 1. Lamvin, Inc.
 - 2. MBI Products Company, Inc.
 - 3. Wall Technology, Inc.; an Owens Corning company.

2.2 ACCESSORIES

- A. Adhesive: Solvent-free, SBR type linoleum adhesive (L-910W) or polyvinyl acetate dispersion type (contact adhesive) when used in a press.
- B. Color matched caulk:
 - 1. C100-14: Acrylic caulk deep sea.
 - 2. C100-06: Acrylic caulk harbor
 - 3. C100-13: Acrylic caulk botanical
 - 4. C100-86: Acrylic caulk acorn
- C. J-Trim for **Tac-Wall**
 - 1. JT12-00: Clear satin, anodized aluminum, 1/4 inch (6 millimeter) trim (old: JTRM-00).

PART 3 - EXECUTION**3.1 EXAMINATION**

Examine areas and conditions in which tackable wallcoverings will be installed.

- 1. Complete finishing operations, including painting, before beginning installation of tackable wallcovering materials.
- 2. Wall surfaces to receive wallcovering materials shall be dry and free from dirt, grease, loose paint, and scale.
- 3. Notify the contractor and architect in writing of any conditions detrimental to the proper and timely completion of the installation.
- 4. Beginning of installation means acceptance of surface conditions.

3.2 PREPARATION

- A. Surface Preparation: Remove hardware, accessories, plates, and similar items to allow tackable wallcovering to be installed.
 - 1. Plaster surface: Remove surface chalk. In new work, use moisture meter to determine moisture content. Do not begin installation when moisture content is greater than five percent.
 - 2. Gypsum board surface: Recess nails and screws. Repair irregular tape joints, sand and remove dust.
 - 3. Painted surface: Remove loose paint or scale. Sand surface of enamel or gloss paint and wipe clean with damp cloth.
 - 4. Ensure wall surfaces scheduled to receive tackable wallcovering are properly sealed with a quality primer specified for use under flexible vinyl wallcoverings.

3.3 APPLICATION

- A. Comply with manufacturer's printed installation instructions.
- B. Cut sheets to size including a few inches of overage. Allow sheets to lay flat for at least twenty-four hours prior to the application. Mark roll direction and sequence on the backside of each sheet. Hang sheets in sequence as cut from the roll, do not reverse sheets.
- C. Permanent HVAC system should be set to 68 degrees Fahrenheit (20 degrees Celsius) for at least seventy-two hours prior to, during, and after the installation.
- D. Back roll each sheet prior to the installation to release curl memory.
- E. For seamed applications, using a seam and strip cutter remove the factory edge of one sheet. Using the same tool, overlap and trace cut the mating edge of the second sheet. Repeat this step for as many sheets as required for the job.
- F. Scribe, cut, and fit material to butt tightly to adjacent surfaces, built-in casework, and permanent fixtures and pipes.
- G. Apply adhesive with a 1/16- inch square notch trowel to the area to receiving the sheet (apply enough for one sheet at a time).
- H. Work from top to bottom then side to side. Roll sheet firmly into adhesive for positive contact and to remove air bubbles.
- I. Remove adhesive residue immediately after each panel is hung with a mild soap/water solution and a soft cloth/sponge.
- J. Joints: Butted.

3.4 CLEANING

- A. Clean wallcovering using a sponge with a neutral pH cleaning solution. Do not use abrasive cleaners. Rinse thoroughly with water and let dry before using.
- B. It is important to remove adhesive while wet.

SPECIFICATIONS

NO.22-0400

3.5 PROTECTION

Protect installed product and finish surfaces from damage during construction.

END OF SECTION

**TACKABLE WALLCOVERING
09 72 60-6
DEHESA SCHOOL MODERNIZATION**

SECTION 09 84 13**FIXED SOUND-ABSORPTIVE PANELS****PART 1 - GENERAL****1.1 GENERAL REQUIREMENTS**

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.
- B. Materials installed under this section shall meet a Class-A rating per the California Fire Code – 2022 edition.

1.2 WORK INCLUDED

- A. Work of the Section includes all labor, materials, equipment and services necessary to complete the furnishing and installation of sound absorptive wall and ceiling treatments as shown on the drawings and specified herein, including but not necessarily limited to the following:
 - 1. Fiberglass or mineral wool panels wrapped in selected material.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
- B. Related Work:
 - 1. Section 09 51 13 -Acoustical Panel Ceilings
 - 2. Section 09 90 00 – Painting and Coating.
- C. Consult all other Sections to determine the extent of work specified elsewhere but related to this Section. This work shall be properly coordinated to produce an installation satisfactory to the Owner.

1.4 SUBMITTALS

- A. Submit samples of all materials specified, and acoustical test data to Architect for approval. No substitutions are to be made without approval. Any non-approved materials that have been installed shall be removed and replaced with approved materials at no expense to the Owner.
- B. Shop Drawings: Submit complete fabrication and installation Drawings for all assemblies. Provide full size details of all major components. Submittals of panel layouts for final approval shall show field verified dimensions.
- C. Submit sound absorption test data measured in an independent accredited acoustical test laboratory demonstrating compliance with acoustical performance

FIXED SOUND-ABSORPTIVE PANELS**09 84 13-1****DEHESA SCHOOL MODERNIZATION**

SPECIFICATIONS

22-0400

specification. Laboratory test samples shall be equal to the specified products with respect to core material, thickness, finish, and mounting. Products shall be tested in a Type A mounting unless otherwise specified.

1.5 PRODUCT HANDLING

- A. Shipping: Package, handle, transport and store materials at the jobsite in a manner that will avoid damage. Materials shall be delivered in manufacturer's original labeled, unopened cartons. Do not deliver any project material until spaces or other surfaces to receive it are prepared.
- 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.

1.6 REFERENCES

- A. ASTM C-423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- B. ASTM E-84 Standard Test Method for Surface Burning Characteristics of Building Materials.

1.7 REGULATORY REQUIREMENTS

- A. Comply with 2022 California Building Code (CBC) and California Fire Code (CFC) Class-A rating.
- B. Flame Spread: 25 or less
- C. Smoke Density: 450 or less per ASTM E-84 Test Method

1.8 QUALITY ASSURANCE

- A. Wall panel fabricator shall be qualified for the work of this Section and shall have minimum 5 years' experience with installations of similar construction.
- B. No substitutions are to be made without approval. Any non-approved materials that have been installed shall be removed and replaced with approved materials at no expense to the Owner.
- C. Specified Products are specified to establish standards of quality, performance and design concept. The products of other manufacturers are acceptable by prior approval only.
- D. The following manufacturers are approved to provide Acoustical Wall and Ceiling Treatments provided systems are in compliance with the requirements of the Contract Documents:

SPECIFICATIONS

22-0400

1. Acoustics First Corporation – Richmond, VA www.acousticsfirst.com
2. Kinetics Noise Control – Dublin, OH www.kineticsnoise.com
3. Lamvin, Inc. – Oceanside, CA www.lamvin.com (**Basis of Design**)

1.9 COORDINATION

- A. Coordinate acoustical wall and ceiling panel work with all existing conditions.

1.10 WARRANTY

- A. Provide written manufacturer's warranty providing minimum 3 year warranty of materials and workmanship.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Fabricate treatments to details and configurations shown on the Drawings in accordance with approved Shop Drawings and Mock-ups.

2.2 WALL-MOUNTED SOUND-ABSORPTIVE PANELS

- A. Acoustical Wall Panel Type A1
 1. Panel Core: 1" thick rigid fiberglass board or mineral wool, with a minimum density of 6 lbs per cubic foot.
 2. Panel edges and ends shall be square.
 3. Panels are to be wrapped with Architect's selected sound-transparent fabric, neatly wrapped around the edges and at least 3" onto back of panel. See drawings for fabric selection.
 4. NRC 0.85 or greater per ASTM C-423, Type A mounting.
 5. Flame Spread Rating: 25 or less
 6. Smoke Density Rating: 450 or less, in accordance with ASTM E-84 test method.
 7. Size and quantity per drawings.
 - a) Basis of Design: Lamvin: Maharam, Manner 466177
 - b) Colors: Refer to Finish Legend

2.3 ADHESIVE

- A. Contact Adhesive: As recommended by panel manufacturer.

PART 3 - EXECUTION**3.1 PROTECTION**

- A. Protect treatments from damage and soiling during shipping and installation until Owner's acceptance.

3.2 EXAMINATION

- A. Examine conditions of the substrate and the general conditions under which the work is to be performed. Notify the Architect of any unsatisfactory conditions. Do not proceed until unsatisfactory conditions are corrected.
- B. Field measure the substrate to be treated. Confirm that the as-built conditions will allow a high-quality result in conformance with the Drawings and Specifications.

3.3 PANEL INSTALLATION

- A. Mounting Systems:
 - 1. Option 1: Manufacturer shall provide a mechanical system using concealed continuous panel Z-clips of galvanized steel permanently bonded to the rear of the panels, and a matching Z-track leveled and attached to wall or ceiling per manufacturer's standard recommendations.
 - 2. Option 2: Wall panels shall be supported at bottom with continuous aluminum angles screw-fastened to wall. Angle sizes shall be as follows: 1" thick panels – 3/4" x 3/4", 2" thick panels - 1.5"x 1.5" angles. Wall panels shall be secured to wall with panel adhesive as recommended by panel manufacturer.
- B. Install and adjust panels to lines and levels to provide accurate alignment and reveal widths as detailed.
- C. Clean, repair or replace any panels which become soiled or damaged. Edges shall be clean and true. Chipped edges will not be acceptable.

3.4 CLEAN

- A. Clean installation area of excess materials and adhesive spots.
- B. Clean panels of soil due to installation and construction activities.

END OF SECTION

**SECTION 09 91 13
EXTERIOR PAINTING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on exterior substrates.
 - 1. Steel and iron.
 - 2. Galvanized metal.
 - 3. Aluminum (not anodized or otherwise coated).
 - 4. Wood.
 - 5. Portland cement plaster (stucco).
- B. Related Requirements:
 - 1. Section-05 50 00 "Metal Fabrications" for shop priming metal fabrications.
 - 2. Section-05 52 13 "Pipe and Tube Railings" for shop priming pipe and tube railings.
 - 3. Section-09 91 23 "Interior Painting".

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.

- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 QUALITY ASSURANCE

- A. Paint Contractor shall have a minimum of five years documented experience in application of paints and coatings specified. Contractor shall maintain qualified painting crews during entire painting process.
- B. Regardless of selected paint manufacturer, Contractor is to provide exact color and gloss to match Architect's selection at no additional cost.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

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 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.

1.7 EXTRA MATERIALS

- A. Provide extra materials. 1 gallon per applied color.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. PPG Industries.
 - 2. Sherwin-Williams Company (Basis of Design).
 - 3. Vista Paint Corporation.
 - 4. Dunn-Edwards Paints.

5. The Garland Company, Inc. (800)321-9336) **Basis of Design**
 - a. "Tuff-Coat" is emulsified acrylic exterior plaster coating. Follow manufacturer's written instructions for prep, prime and application of product. Color: Sandstone Texture: Smooth

2.2 PAINT, GENERAL

- A. Do not provide materials that contain substances classified by the Global Hazard System as carcinogenic.
- B. Do not provide materials that contain substances listed in the Significant New Use Rule (SNUR) under Toxic Substances Control Act (TSCA).
- C. Material Compatibility:
 1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- D. Colors: As indicated in the Finish Schedule
- E. Material Quality: Provide manufacturer's best quality paint material of the various types specified that are factory formulated and recommended by manufacturer for application indicated. Use only paint material containers displaying manufacturer's product identification.
- F. Regulatory Requirements: Coatings shall comply with the testing and product requirements of San Diego Air Pollution Control District Rule 67.0 "Architectural Coatings."

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: District reserves the right to invoke the following procedure:
 1. District will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 2. Testing agency will perform tests for compliance with product requirements.
 3. District may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove

rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

2.4 PRIMERS/SEALERS

A. Concrete and Masonry Alkali-Resistant Primer:

1. Dunn-Edwards Paints; ESPR00 Eff-Stop Premium.
2. PPG Paints; Perma-Crete Interior/Exterior Alkali Resistant Primer 4-603XI.
3. Sherwin-Williams Company; Loxon Primer A24W8300.
4. Vista Paint Corporation; 4600 Uniprime.
5. Or Equal.

B. Acrylic Bonding Primer (for previously painted or glossy surfaces):

1. Dunn-Edwards Paints; SLPR00 Super-Loc.
2. PPG Paints; Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer, 17-921XI.
3. Sherwin-Williams Company; PrepRite ProBlock B51W8020.
4. Vista Paint Corporation; 4000 Uniprime.
5. Or Equal.

2.5 METAL PRIMERS

A. Acrylic Ferrous Metal Primer:

1. Dunn-Edwards Paints; ENPR00 EnduraPrime.
2. PPG Paints; Pitt Tech Plus 4020PF Primer.
3. Sherwin-Williams Company; ProCryl B66.
4. Vista Paint Corporation; 4800 Metal Pro Acrylic Primer.

B. Acrylic Galvanized and Non-Ferrous Metal Waterborne Primer. (Galvanized metal shall be acid-etched with manufacturer's recommended phosphoric acid solution and rinsed before priming.):

1. Dunn-Edwards Paints; ULGM00 UltraShield Galvanized Metal Primer.
2. PPG Paints; Pitt Tech Plus 4020PF Primer.
3. Sherwin-Williams Company; ProCryl B66.
4. Vista Paint Corporation; 4800 Metal Pro Acrylic Primer.
5. Or Equal.

2.6 WOOD PRIMERS

A. Exterior Latex Wood Primer:

1. Dunn-Edwards Paints; EZPR00 EZ-Prime Premium.
2. PPG Paints; Seal Grip Interior/Exterior Stain-Killing Primer 17-921.
3. Sherwin-Williams Company; Prep Rite Pro Block B51W8020.

4. Vista Paint Corporation; 4200 Terminator.

2.7 EXTERIOR LATEX PAINTS

- A. Exterior emulsified acrylic architectural exterior plaster coating
 1. The Garland Company, Inc.: Tuff-Coat
 2. Or Equal
- B. Exterior Acrylic Latex (Flat):
 1. Dunn-Edwards Paints; SSHL10 Sparta Shield Flat.
 2. PPG Paints; Sun Proof Exterior Flat, 72-45XI.
 3. Sherwin-Williams Company; A-100 Flat A6.
 4. Vista Paint Corporation; 2000 Duratone.
- C. Exterior Acrylic Latex (Semigloss):
 1. Dunn-Edwards Paints; SSHL50 Sparta Shield Semi Gloss.
 2. PPG; 4216 HP Series Pitt-Tech Plus DTM Semigloss.
 3. Sherwin-Williams Company; ProIndustrial DTM Acrylic Semigloss B66-1150.
 4. Vista Paint Corporation; 8400 Carefree.
- D. Exterior Acrylic Latex (Gloss):
 1. Dunn-Edwards Paints; SSHL60 Sparta Shield Gloss.
 2. PPG; 4216 HP Pitt-Tech Plus DTM Gloss.
 3. Sherwin-Williams Company; ProIndustrial DTM Acrylic Gloss, B66-1050.
 4. Vista Paint Corporation; 8500 Carefree Gloss.

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 CMUs): 12 percent.
 3. Wood: 15 percent.
 4. Portland Cement Plaster: 12 percent.
 5. Gypsum Board: 12 percent.
- C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.

- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. 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 applicable to substrates and paint systems 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.
- C. Clean substrates of substances and conditions that could impair bond of paints, including peeling paint, 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.
- 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 2.
 - 2. SSPC-SP 3.
 - 3. SSPC-SP 7/NACE No. 4.
 - 4. SSPC-SP 11.
- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. 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: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

- H. Exterior Plaster Substrates: Verify that exterior plaster has fully cured.
- I. Aluminum Substrates: Remove surface oxidation per SSPC-SP1.
- J. Exterior Board Substrates: Do not begin paint application until verification of manufacturer recommended paint system.
- K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates
- L. Wood Substrates:
 - 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
 - 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.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Apply paints to meet manufacturer's recommended dry film thickness per coat.
 - 3. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 4. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 5. Paint entire exposed surface of window frames and sashes.
 - 6. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 7. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. 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.

E. 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. Tanks that do not have factory-applied final finishes.
 - h. Exterior condensate piping, all exposed exterior conditions whether exposed to view or not.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: District may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 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.

3.6 EXTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
1. Latex System:

- a. Prime Coat: Concrete and Masonry Alkali-Resistant Primer.
 - b. Intermediate Coat: Exterior Acrylic Latex.
 - c. Topcoat: Exterior Acrylic Latex, semigloss.
- B. Concrete Substrates, Traffic Surfaces:
 - 1. Latex Floor Paint System:
 - a. Prime Coat: Latex Floor Paint, matching topcoat.
 - b. Intermediate Coat: Latex Floor Paint, matching topcoat.
 - c. Topcoat: Latex Floor Paint, low gloss.
- C. Clay-Masonry Substrates:
 - 1. Latex System:
 - a. Prime Coat: Concrete and Masonry Alkali-Resistant Primer.
 - b. Intermediate Coat: Exterior Acrylic Latex.
 - c. Top Coat: Exterior Acrylic Latex, semigloss.
- D. CMU Substrates:
 - 1. Latex System:
 - a. Prime Coat: Exterior Latex Block Filler.
 - b. Intermediate Coat: Exterior Acrylic Latex.
 - c. Topcoat: Exterior Acrylic Latex, semigloss.
- E. Steel and Iron Substrates:
 - 1. Acrylic System:
 - a. Prime Coat: Acrylic Ferrous Metal Primer.
 - b. Intermediate Coat: Exterior Acrylic Latex.
 - c. Topcoat: Exterior Acrylic Latex, semigloss.
- F. Galvanized-Metal Substrates:
 - 1. Latex System:
 - a. Pretreatment: Non-ferrous metal pretreatment recommended by paint system manufacturer.
 - b. Prime Coat: Acrylic Galvanized and Non-Ferrous Metal Waterborne Primer.
 - c. Topcoats: Two coats of Exterior Acrylic Latex, semigloss.
 - 2. High Performance Coating System:
 - a. Prime Coat: Epoxy Primer.
 - b. Intermediate Coat: Polysiloxane, matching topcoat.

- c. Topcoat: Polysiloxane, semigloss.
- G. Aluminum Substrates:
 - 1. Latex System:
 - a. Prime Coat: Acrylic Galvanized and Non-Ferrous Metal Waterborne Primer.
 - b. Intermediate Coat: Exterior Latex, match topcoat.
 - c. Topcoat: Exterior Latex, semigloss.
- H. Wood Substrates: Glued-laminated construction.
 - 1. Latex System:
 - a. Prime Coat: Exterior Latex Wood Primer.
 - b. Intermediate Coat: Exterior Acrylic Latex.
 - c. Topcoat: Exterior Acrylic Latex, semigloss.
- I. Wood Substrates: Exposed framing.
 - 1. Latex System:
 - a. Prime Coat: Exterior Latex Wood Primer.
 - b. Intermediate Coat: Exterior Acrylic Latex.
 - c. Topcoat: Exterior Acrylic Latex, semigloss.
- J. Wood Substrates: Wood trim, Architectural woodwork and Wood board siding
 - 1. Latex System:
 - a. Prime Coat: Exterior Latex Wood Primer.
 - b. Intermediate Coat: Exterior Acrylic Latex.
 - c. Topcoat: Exterior Acrylic Latex, semigloss .
- K. Wood Substrates: Wood-based panel products.
 - 1. Latex System:
 - a. Prime Coat: Exterior Latex Wood Primer.
 - b. Intermediate Coat: Exterior Acrylic Latex.
 - c. Topcoat: Exterior Acrylic Latex, semigloss.
- L. Portland Cement Plaster Substrates:
 - 1. Emulsified Acrylic Coating System **(Basis of Design)**
 - a. Tuff-Coat by Garland Co. Inc. (800)321-9336: Refer to Part 2: Products: 2.1 Manufacturers: A.5 for description. Apply system per manufacturer's written instructions.

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2. Latex Paint System

- a. Prime Coat: Exterior Acrylic Latex.
- b. Intermediate Coat: Exterior Acrylic Latex.
- c. Topcoat: Exterior Acrylic Latex, semigloss.

END OF SECTION 09 91 13

**SECTION 09 91 23
INTERIOR PAINTING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Concrete masonry units (CMUs).
 - 3. Steel and iron.
 - 4. Galvanized metal.
 - 5. Wood.
 - 6. Gypsum board.
 - 7. Plaster.
 - 8. Acoustic panels and tiles.
 - 9. Spray-textured ceilings.
 - 10. Cotton or canvas insulation covering.
 - 11. ASJ insulation covering.
- B. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing" for shop priming structural steel.
 - 2. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.
 - 3. Section 09 91 13 "Exterior Painting".

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Indicate VOC content.
- D. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
 2. Apply coats on Samples in steps to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.
- E. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 QUALITY ASSURANCE

- A. Paint Contractor shall have a minimum of five years documented experience in application of paints and coatings specified. Contractor shall maintain qualified painting crews during entire painting process.
- B. Regardless of selected paint manufacturer, Contractor is to provide exact color and gloss to match Architect's selection at no additional cost.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

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 when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

- A. Provide extra materials. 1 gallon per applied color

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. PPG Industries.
 - 2. The Sherwin-Williams Company
 - 3. Vista Paint Corporation.
 - 4. Dunn-Edwards Paints.
 - 5. Rosco Laboratories Inc. (for Green Screen)

2.2 PAINT, GENERAL

- A. Do not provide materials that contain substances classified by the Global Hazard System as carcinogenic.
- B. Do not provide materials that contain substances listed in the Significant New Use Rule (SNUR) under Toxic Substances Control Act (TSCA)
- C. Material Compatibility:
 - 1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- D. Colors: As indicated in the Finish schedule
- E. Material Quality: Provide manufacturer's best quality paint material of the various types specified that are factory formulated and recommended by manufacturer for application indicated. Use only paint material containers displaying manufacturer's product identification.
- F. Regulatory Requirements: Coatings shall comply with the testing and product requirements of San Diego Air Pollution Control District Rule 67.0 "Architectural Coatings."

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: District reserves the right to invoke the following procedure:
 - 1. District will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site,

samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.

2. Testing agency will perform tests for compliance with product requirements.
3. District may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

2.4 BLOCK FILLERS

A. Interior/Exterior Latex Block Filler:

1. Dunn-Edwards Paints; SBSL00 Smooth Bloc-Fil Select.
2. PPG Paints; 6-4900 XI Speedhide Zero Interior Zero VOC Latex Sealer.
3. Sherwin-Williams Company; B25W25 Block Filler.
4. Vista Paint Corporation; 40 Block Kote.

2.5 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer for gypsum board:

1. Dunn-Edwards Paints; VNSL00 Vinylastic Select.
2. PPG Paints; 6-4900 XI Speedhide Zero Interior Zero VOC Latex Sealer.
3. Sherwin-Williams Company; ProMar 200 Zero VOC Primer, B28W2600.
4. Vista Paint Corporation; 5000 V-Pro Primer.

B. Interior Latex Primer/Sealer for concrete, plaster and porous surfaces:

1. Dunn-Edwards Paints; UGPR00 Ultra-Grip Premium.
2. PPG SEAL GRIP; Interior/Exterior Acrylic Universal Primer/Sealer 17-921XI.
3. Sherwin-Williams Company; Prep Rite ProBlock B51W8020.
4. Vista Paint Corporation; 4000 Uniprime.

C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.6 METAL PRIMERS

A. Acrylic Ferrous Metal Primer:

1. Dunn-Edwards Paints; ENPR00 EnduraPrime.
2. PPG Paints; Pitt Tech Plus 4020PF Primer.
3. Sherwin-Williams Company; ProCryl B66.
4. Vista Paint Corporation; 4800 Metal Primer.

B. Acrylic Non-Ferrous Metal Primer:

1. Dunn-Edwards Paints; ENPR00 EnduaPrime.
2. PPG Paints; Pitt Tech Plus 4020PF Primer.
3. Sherwin-Williams Company; ProCryl B66
4. Vista Paint Corporation; 4800 Metal Pro Acrylic Metal Primer.

C. Non-Ferrous Metal Pretreatment:

1. Dunn-Edwards Paints; Krud Kutter Metal Clean and Etch.
2. PPG Paints; Krud Kutter Metal Clean and Etch.
3. Sherwin-Williams Company; GLL Clean 'n Etch.
4. Vista Paint Corporation; Jasco Prep 'n Prime.

2.7 WOOD PRIMERS**A. Interior Latex Wood Primer:**

1. Dunn-Edwards Paints; DCPR00 DecoPrime.
2. PPG Paints; Seal Grip Interior/Exterior Stain-Killing Primer 17-921.
3. Sherwin-Williams Company; Pro Block B51W8020.
4. Vista Paint Corporation; 4000 Uniprime.

2.8 ACRYLIC LATEX PAINTS**A. Interior Acrylic Latex (Flat):**

1. Dunn-Edwards Paints; SWLL10 SpartaWall Flat.
2. PPG Paints; 6-4110xi Speedhide Zero VOC Flat.
3. Sherwin-Williams Company; ProMar 200 Zero VOC Flat B30W2600.
4. Vista Paint Corporation; 8100 Carefree.

B. Interior Acrylic Latex (Eggshell):

1. Dunn-Edwards Paints; SWLL30 Sparta Wall Eggshell.
2. PPG Paint; 6-4310xi Speedhide Zero VOC Eggshell.
3. Sherwin-Williams Company; ProMar 200 Zero VOC Eggshell B20W2600.
4. Vista Paint Corporation; 8300 Carefree.

C. Interior Acrylic Latex (Low Sheen):

1. Dunn-Edwards Paints; SWLL40 Sparta Wall Low Sheen.
2. PPG Paints; 9-300XI PURE PERFORMANCE® Interior Latex Eggshell.
3. Sherwin-Williams Company; ProMar 200 Zero VOC Low Sheen, B24-2600.
4. Vista Paint Corporation; 8200 Carefree Velvasheen

D. Interior Acrylic Latex (Semigloss):

1. Dunn-Edwards Paints; SWLL50 Sparta Wall Semi Gloss.
2. PPG Paints; 4216 HP Series Pitt-Tech Plus Interior/Exterior high performance waterborne Semi-Gloss DTM Enamel.
3. Sherwin-Williams Company; ProIndustrial DTM Acrylic Semigloss B66-1150.
4. Vista Paint Corporation; 8400 Carefree.

E. Interior Acrylic Latex (Gloss):

1. Dunn-Edwards Paints; ASHL70 AristoShield.
2. PPG; 4216 HP Series Pitt-Tech Plus Interior/Exterior high performance waterborne Gloss DTM Enamel.
3. Sherwin-Williams Company; ProIndustrial DTM Acrylic Gloss B66-1050.
4. Vista Paint Corporation; 8500 Carefree.

F. Institutional Low-Odor/VOC Latex (Flat):

1. Dunn-Edwards Paints; SWLL10 SpartaWall Flat.
2. PPG Paints Speedhide Zero Int Flat 6-4110X.
3. Sherwin-Williams Company; ProMar 200 Zero VOC Flat B30-2600.
4. Vista Paint Corporation; 5100 V-Pro Flat.

G. Institutional Low-Odor/VOC Latex (Eggshell):

1. Dunn-Edwards Paints; SWLL30 SpartaWall Eggshell.
2. PG Paints; 6-4310xi Speedhide Zero VOC Eggshell.
3. Sherwin-Williams Company; ProMar 200 Zero VOC Eggshell B20-2600.
4. Vista Paint Corporation; 5300 V-Pro Eggshell.

H. Institutional Low-Odor/VOC Latex (Semigloss):

1. Dunn-Edwards Paints; SWLL50 SpartaWall Semi Gloss.
2. PPG Paints; 6-4510xi Speedhide ZERO VOC Semi-Gloss.
3. Sherwin-Williams Company; ProMar 200 Zero VOC Semigloss B31-2600.
4. Vista Paint Corporation; 5400 V-Pro Semi-gloss.

2.9 DRY FOG/FALL COATINGS

A. Latex Dry Fog/Fall:

1. Dunn-Edwards Paints; AQUA10 AQUAFALL Flat.
2. PPG Paints; Speedhide Super Tech WB Interior Latex Dry Fog Flat.
3. Sherwin-Williams Company; Low VOC WB Dryfall Flat B42W81
4. Vista Paint Corporation; DF12 Dry Fall.
5. Or Equal.

2.10 FLOOR COATINGS

- A. Interior/Exterior Clear Concrete Floor Sealer (Water Based):
 - 1. Dunn-Edwards Paints; OKN-06 Okon Seal and Finish.
 - 2. PPG Paints; Perma-Crete PLEX-SEAL® WB Interior/Exterior Clear Sealer 4-6200X.
 - 3. Sherwin-Williams Company; H&C WL Sealer.
 - 4. Vista Paint Corporation; Monpole Aquaseal SS.
- B. Latex Floor Enamel (Non-skid, low gloss):
 - 1. Dunn-Edwards Paints; Desert Brand CMFPS.
 - 2. PPG Paints; ROC-18 Rust-Oleum Porch + Floor.
 - 3. Sherwin-Williams Company; Armorseal Tread-plex B90W111.
 - 4. Vista Paint Corporation; Acripoxy 400.

2.11 GREEN SCREEN PAINT

- A. Rosco video paint chroma key green, RF5711 (Alternate product code: XY5974) Rosco Laboratories Inc. (203)-708-8900, www.rosco.com
 - 1. Reference Finish schedule for location.
- B. Or Equal

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. Fiber-Cement Board: 12 percent.
 - 3. Concrete Masonry: 12 percent.
 - 4. Wood: 15 percent.
 - 5. Gypsum Board: 12 percent.
 - 6. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.
- 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 applicable to substrates and paint systems 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 peeling paint, 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.
- E. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. 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 2.
 - 2. SSPC-SP 3.
 - 3. SSPC-SP 11.

- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue, per SSPC-SP1, from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- 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.
- J. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry, sanded smooth, and dust free. Sand hard, slick, previously painted surfaces and remove all sanding dust.
- K. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.
- L. Spray-Textured Ceiling Substrates: Do not begin paint application until surfaces are dry.
- M. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

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- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. 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.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms:
 - 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. Tanks that do not have factory-applied final finishes.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - i. Mechanical equipment that is indicated to have factory-primed finish for field painting.
 - j. Electrical equipment that is indicated to have a factory-primed finish for field painting.
 - 2. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - 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. Other items as directed by Architect.
 - 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: District may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.

2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 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.

3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Interior Latex Primer/Sealer for concrete, plaster and porous surfaces.
 - b. Intermediate Coat: Interior Acrylic Latex.
 - c. Topcoat: Interior Acrylic Latex, semigloss.
- B. Concrete Substrates, Traffic Surfaces:
 1. Latex Floor Enamel System:
 - a. Prime Coat: Latex Floor Enamel.
 - b. Topcoat: Latex Floor Enamel.
 2. Water-Based Clear Sealer System:
 - a. Prime Coat: Interior/Exterior clear concrete floor sealer (water based).
 - b. Topcoat: Interior/Exterior clear concrete floor sealer (water based).
- C. CMU Substrates:
 1. Institutional Low-Odor/VOC Latex System:

- a. Block Filler/Prime Coat: Interior/Exterior Latex Block Filler.
 - b. Intermediate Coat: Interior Acrylic Latex.
 - c. Topcoat: Interior Acrylic Latex, semigloss.
- D. Steel Substrates:
 - 1. Latex System:
 - a. Prime Coat: Acrylic Ferrous Metal Primer.
 - b. Intermediate Coat: Primer, Interior Acrylic Latex.
 - c. Topcoat: Interior Acrylic Latex, low-sheen.
- E. Galvanized-Metal and Non-Ferrous Substrates:
 - 1. Latex System:
 - a. Pretreatment: Non-Ferrous Metal Pretreatment.
 - b. Prime Coat: Acrylic Non-Ferrous Metal Primer.
 - c. Topcoat: Two coats of Interior Acrylic Latex, low-sheen.
- F. Wood Substrates: Glued-laminated construction.
 - 1. Latex System:
 - a. Prime Coat: Interior Latex Wood Primer.
 - b. Intermediate Coat: Interior Acrylic Latex.
 - c. Topcoat: Interior Acrylic Latex, low-sheen.
- G. Wood Substrates: Exposed framing.
 - 1. Latex System:
 - a. Prime Coat: Interior Latex Wood Primer.
 - b. Intermediate Coat: Interior Acrylic Latex.
 - c. Topcoat: Interior Acrylic Latex, low-sheen.
- H. Wood Substrates: Wood trim, Architectural woodwork, wood board paneling.
 - 1. Latex System:
 - a. Prime Coat: Interior Latex Wood Primer.
 - b. Intermediate Coat: Interior Acrylic Latex.
 - c. Topcoat: Interior Acrylic Latex, semigloss.
- I. Wood Substrates: Wood paneling and casework.
 - 1. Latex System:
 - a. Prime Coat: Interior Latex Wood Primer.
 - b. Intermediate Coat: Interior Acrylic Latex.

- c. Topcoat: Interior Acrylic Latex, low-sheen.
- J. Spray-Textured Ceiling Substrates:
 - 1. Latex, (Flat) System:
 - a. Prime Coat: Interior Latex Primer/Sealer appropriate for surface.
 - b. Topcoat: Latex Dry Fog/Fall.
- K. Gypsum Board Substrates:
 - 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Interior Latex Primer/Sealer for gypsum board.
 - b. Intermediate Coat: Interior Acrylic Latex.
 - c. Top Coat: Interior Acrylic Latex, low-sheen.
- L. Plaster Substrates:
 - 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Interior Latex Primer/Sealer for concrete, plaster and porous surfaces.
 - b. Intermediate Coat: Interior Acrylic Latex.
 - c. Top Coat: Interior Acrylic Latex, eggshell.
- M. Cotton or Canvas and ASJ Insulation-Covering Substrates: Including pipe and duct coverings.
 - 1. Latex System:
 - a. Prime Coat: Interior Latex Primer/Sealer.
 - b. Intermediate Coat: Interior Latex, (matching topcoat).
 - c. Topcoat: flat.

END OF SECTION 09 91 23

SECTION 10 11 00
VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Visual display board assemblies, including markerboards and tackboards.

1.3 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site a minimum of two weeks before Work of this Section is to commence.

1.4 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.
- 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. Include sections of typical trim members.
- C. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:
 - 1. Samples of facings for each visual display panel type, indicating color and texture. Provide all colors and textures available from the manufacturer for selection by the Architect.
 - 2. Fabric swatches of fabric facings for tackboards. Provide all colors and textures available from the manufacturer for selection by the Architect.

3. Actual factory-finish color samples, applied to aluminum substrate.
4. Include accessory Samples to verify color selected.

D. Samples: For each type of visual display unit indicated.

1. Visual Display Panel: Not less than 8-1/2-by-11 inches, with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.
2. Trim: 6-inch-long sections of each trim profile.
3. Display Rail: 6-inch-long section of each type.
4. Accessories: Full-size Sample of each type of accessory.

E. Product Schedule: For visual display units. Use the same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of tackboards.
- C. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For visual display units to include in maintenance manuals.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.9 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces exhibit crazing, cracking, or flaking.
2. Warranty Period:
 - a. Markerboards: Life of the building.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.

2.3 VISUAL DISPLAY BOARD ASSEMBLY

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. A-1 Visual Systems.
 2. Claridge Products and Equipment, Inc.
 3. Platinum Visual Systems.
- B. Visual Display Board Assembly: Factory fabricated to the greatest extent possible.
 1. Assembly: Markerboard.

2. Corners: Square
 3. Width: As indicated on Drawings
 4. Height: As indicated on Drawings.
 5. Mounting Method: Direct to wall as indicated.
- C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.
1. Color: As selected by Architect from full range of industry colors.
- D. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-thick, extruded aluminum; of size and shape indicated on Drawings.
1. Field-Applied Trim: Manufacturer's standard screw-on trim with Phillips flat-head screws.
 2. Aluminum Finish: Clear anodic finish.
- E. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
- F. Combination Assemblies: Provide manufacturer's standard exposed trim between abutting sections of visual display panels.
- G. Tray: Manufacturer's standard; continuous. As indicated on drawings
- H. Display Rail: Manufacturer's standard, extruded-aluminum display rail with plastic-impregnated-cork insert, end stops, and continuous paper holder, designed to hold accessories.
1. Size: 3 inches high by full length of visual display unit.
 2. Map Hooks and Clips: Two map hooks with flexible metal clips for every 48 inches of display rail or fraction thereof.
 3. Flag Holder: One for each room.
 4. Tackboard Insert Color: As selected by Architect from full range of industry colors.

2.4 SLIDING VISUAL DISPLAY UNITS

- A. Horizontal-Sliding Visual Display Units: Factory-fabricated units consisting of extruded-aluminum tubular frame, fixed rear visual display panel, 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A-1 Visual Systems.
 - b. Claridge Products and Equipment, Inc.

- c. Platinum Visual Systems.
 - 2. Two-Track Units: As indicated on drawings. Provide four sliding panels, as indicated on drawings.
 - 3. Hardware: Manufacturer's standard, extruded-aluminum overhead track and channel-shaped bottom guides; with two nylon ball-bearing carriers and two nylon rollers for each sliding panel.
 - 4. Overall Width: As indicated on Drawings.
 - 5. Overall Height: As indicated on Drawings.
 - 6. Provide tray along bottom of unit.
 - 7. The force required to slide the panels shall be 5 pounds maximum.
- B. Panels and Accessories:
 - 1. Sliding Markerboard Panel: Porcelain-enamel-faced markerboard panel on kraft-paper honeycomb core designed to be rigid and to resist warpage, not less than 3/8-inch.
 - a. Color: White
 - 2. Accessories: tray.
 - 3. Display Rail: Manufacturer's standard, extruded-aluminum display rail with plastic-impregnated-cork insert, end stops, and continuous paper holder, designed to hold accessories.
 - a. Size: 3 inches high by full length of visual display unit.
 - b. Map Hooks: Two map hooks for every 48 inches of display rail or fraction thereof.
 - c. Flag Holder: One for each Classroom.
 - 4. Aluminum Trim: Clear anodic finish.

2.5 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.
 - 1. Particleboard Core: 3/8-inch with 0.015-inch-thick, aluminum sheet backing.
 - 2. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

2.6 MATERIALS

- A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

- B. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish with surface-burning characteristics indicated.
- C. Vinyl Fabric: Mildew resistant, washable, complying with FS CCC-W-408D, Type II, weighing not less than 13 oz./sq. yd.; laminated to 1/4-inch- thick cork sheet, with surface-burning characteristics indicated in Performance Requirements.
- D. Hardboard: ANSI A135.4, tempered.
- E. Fiberboard: ASTM C 208.
- F. Particleboard: ANSI A208.1, Grade M-1.
- G. Hardwood Plywood: HPVA HP-1.
- H. Extruded Aluminum: ASTM B 221, Alloy 6063.
- I. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.
 - 1. Adhesive shall comply with the testing and product requirements of San Diego Air Pollution Control District Rule 67.0 "Architectural Coatings" and Rule 67.21 "Adhesive Material Application Operations."
- J. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in Section 09 91 23 "Interior Painting" and recommended in writing by visual display unit manufacturer for intended substrate.

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, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
- 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. Prime wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.
- E. 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-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.
- D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings. Attach to wall framing with fasteners at not more than 16 inches o.c.
- E. Sliding Visual Display Units: Install units at mounting heights indicated. Attach to casework per manufacturer.
 - 1. Adjust panels to operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.4 CLEANING AND PROTECTION

- A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit 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 10 11 00

SECTION 10 14 23**PANEL SIGNAGE****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY**A. Section Includes:**

- 1. Panel signs.
- 2. Room-identification signs.

B. Related Requirements:

- 1. Section 01 50 00 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary Informational and directional signs.
- 2. Section 01 56 39 "Temporary Tree and Plant Protection" for temporary protection-zone signage.
- 3. Section 22 05 53 "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
- 4. Section 23 05 53 "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
- 5. Section 26 05 53 "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
- 6. Section 26 52 13 "Emergency and Exit Lighting" for illuminated, self-luminous, and photoluminescent exit sign units.

1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

PANEL SIGNAGE**10 14 23 - 1****DEHESA SCHOOL MODERNIZATION**

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For panel signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Include plans, elevations, and large-scale sections of typical members and other components.
 - 3. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 4. Show typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed color, pattern and surface finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Panel Signs: Full-size Sample.
 - 2. Room-Identification Signs: Full-size Sample.
 - 3. Exposed Accessories: Full-size Sample of each accessory type.
- E. Sign Schedule: Use same designations specified or indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.8 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) 2022 edition
- B. Comply with Access Compliance Signage Requirements per CBC 11B
- C. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and CBC for signs.

- D. Raised characters shall comply with CBC Section 11B-703.2
- E. Depth: Raised characters shall be 1/32-inch minimum above their background and shall be sans-serif uppercase and be duplicated in Braille.
- F. Height: Raised character height shall be 5/8-inch minimum and 2 inches maximum based on the height of the uppercase letter "I" . CBC Section 11B-703.2.5
- G. Finish and contrast: Characters and their background shall have a non-glare finish. Characters shall contrast with their background with either light characters on a dark background or dark characters on a light background. CBC Section 11B-703.5.1
- H. Proportions: raised character proportions shall be selected from fonts where the width of the uppercase letter "O" is 60% minimum and 110% maximum of the height of the uppercase letter "I" . Stroke thickness of the uppercase letter "I" shall be 15% maximum of the height of the character. CBC Sections 11B-703.2.4 and 11B-703.2.6.
- I. Character Spacing: Spacing between individual raised characters shall comply with CBC Section 11B-703.2.7
- J. Line Spacing: Spacing between individual raised characters shall comply with CBC Section 11B-703.2.8
- K. Format: Text shall be in a horizontal format. CBC Section 11B-703.2.9
- L. Braille: Braille shall be contracted (Grade 2) and shall comply with CBC Sections 11B-703.3 and 11B-703.4. Braille dots shall have a domed or rounded shape and shall comply with CBC Figure 11B-703.3.1
- M. Mounting height: Tactile characters on signs shall be located 48" minimum to the Baseline of the lowest Braille cells and 60" maximum to the baseline of the highest line of raised characters above the finish floor or ground surface. CBC Section and Figure 11B-703.4.1.
- N. Mounting location: A tactile sign shall be located per CBC Section and Figure 11B-703.4.2 as follows:
 - 1. Alongside a single door at the latch side.
 - 2. On the inactive leaf at double doors with one active leaf.
 - 3. On the nearest adjacent wall when there is no wall space at the latch side of a single door.
 - 4. At the right side of double doors with two active leaves.
 - 5. (For all cases, a clear floor space of 18"X18" minimum, centered on the tactile characters, shall be provided beyond the arc of any door swing between the closed position and 45-degree open position.)
- O. Visual characters shall comply with CBC Section 11B-703.5 and shall be 40" minimum above finish floor or ground. Visual character stroke thickness of the upper case letter

"I" shall be 10% minimum and 20% maximum of the height of the character. CBC Section 11B-703.5.7.

1. Line Spacing: Spacing between individual raised characters shall comply with CBC Section 11B-703.5.9.
2. Character Spacing: Spacing between individual raised characters shall comply with CBC Section 11B-703.5.8.

- P. Pictograms shall comply with CBC Section 11B-703.6.
- Q. Symbols of accessibility shall comply with CBC Section 11B-703.7.
- R. Variable message signs shall comply with CBC Section 11B-703.8.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Single Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.
- C. Preconstruction Meeting: Schedule an on-site preconstruction meeting a minimum of two weeks before work of this Section is to commence. Topics of discussion shall include but not be limited to the following:
1. Status of the availability of signage products and required staff for installation.
 2. Ability of subcontractor to meet the schedule requirements for installation.
 3. Coordination of work with adjacent and related subcontractors.
 4. Contract Documents
 5. Review of mockups
 6. Acceptability of substrates
 7. Submittals
 8. Related RFIs
 9. Questions, Clarifications, and Project Specifics
- D. District reserves the right to remove signage in random check after all signage is installed. Removed signage will be evaluated as to whether the product specified and approved is provided. If it is determined the signage provided is not the product specified, sub-contractor shall pay to remove and replace all signage with the approved specified product.
- E. Mockups: Build mockups of panel signage installed onto stucco, glass and gypsum board to verify selections and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Subject to compliance with requirements for panel signage and accessories – verify required heights and access. Coordinate with Architect on specific locations and sizes.
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 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication and indicate measurements on Shop Drawings.

1.11 WARRANTY

- A. Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 1. Failures include:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 2. Warranty Period: five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL SIGNS, GENERAL

- A. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the following requirements:
 1. Edge Condition: Square.
 2. Corner Condition: Corners square.
- B. Framed Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16-inch measured diagonally

- C. Sign Types:
1. Exterior Signs: SignEtch, Machined aluminum panels.
 2. Interior Signs: InTouch, single-piece photopolymer.
- D. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.
- E. Raised Copy: Machine-cut copy characters. Produce precisely formed characters with square cut edges free from burrs and cut marks.
1. Raised Copy Thickness: Not less than 1/32-inch.
 2. Character Type: Characters on signs shall be raised and shall be sans serif uppercase characters accompanied by California Contracted Grade 2 Braille.
 3. Character Height (per CBC 11B-703.2.5): Raised characters shall be a minimum of 5/8-inch and a maximum of 2-inches high, based on the height of the uppercase letter 'I'.
 4. Finish and Contrast (per CBC 11B-703.5.1): Contrast between character, symbols and their background must be non-glare, either light characters on dark background or dark characters on light background.
 5. Proportions (per CBC 11B-703.2.4 and CBC 11B-703.2.6): Characters on signs shall have an uppercase letter 'O' that is 60 percent minimum and 110 percent maximum of the height of the uppercase letter 'I'. Stroke thickness of the uppercase letter 'I' shall be 15 percent maximum of the height of the character.
 6. Character Spacing (per CBC 11B-703.2.7): Character spacing shall be measured between the two closest points of adjacent raised characters within a message, excluding word spaces. Where characters have rectangular cross sections, spacing between individual raised characters shall be 1/8-inch minimum and 4 times the raised character stroke width maximum. Where characters have other cross section, spacing between individual raised characters shall be 1/16-inch minimum and 4 times the raised character stroke width maximum at the base of the cross sections, and 1/8-inch minimum and 4 times the raised character stroke width maximum at the top of the cross sections. Characters shall be separated from raised borders and decorative elements 3/8-inch minimum.
 7. Line Spacing (per CBC 11B-703.2.8): Spacing between the baselines of separate lines of raised characters within a message shall be 135 percent minimum and 170 percent maximum of the raised character height.
 8. Braille Symbols (per CBC 11B-703.3 and CBC 11B-703.4): California Contracted Grade 2 Braille shall be used wherever Braille symbols are required. Dots shall have a domed or rounded shape and shall comply with CBC Table 11B-703.3.1. The indication of an uppercase letter or letters shall only be used before the first word of sentences, proper nouns and names, individual letters of the alphabet, initials, and acronyms.

2.2 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and CBC for signs.

2.3 PANEL SIGNS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. ASI Sign Systems, Inc. **(Basis of Design)**
 2. Best Sign Systems, Inc.
 3. Vomar Products, Inc.
- B. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 1. Thickness: 1/8 inch-thick minimum.
 2. Surface Applied Coating: Applied baked enamel or Mathews paint.
 3. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Square.
 - b. Corner Condition in Elevation: Square.
 4. Mounting: Surfaced mounted with vandal-resistant fasteners.
 5. Fastener head finished to match sign panel color.
 6. Text and Typeface: Finish raised characters to contrast with background color, and finish Braille to match background color.
 7. Flatness Tolerance: Sign panel shall remain flat or uniformly curved under install conditions as indicated and within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.
 8. Adhesive-fixed characters are not acceptable.
 9. Letter Styles shall be Helvetica, Regular.
- C. Room-Identification Sign (Interior): Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Monolithic tactile plaque constructed utilizing a single-piece photopolymer which provides a fully homogeneous plaque sign. The sign body, face, raised text and Braille are a single dimensional component that results in a sign surface that exhibits a toughness that resists scratching, cracking, gouging and graffiti. Comply with Characters and letters Regulatory Requirements above and the following requirements:
 - a. Sign Sizes: As indicated on the drawings.
 - b. Material shall be non-glare single piece photopolymer.
 - c. Contrasting Color(s): as indicated on the drawings.
 - d. Tactile character/symbols shall be raised 1/32 inch from sign face. All text has to be accompanied by California Contracted Grade 2 Braille.
 - e. Provide two signs minimum per interior door unless noted or shown otherwise. Refer to signage and door schedules on the drawings.
 - f. Signs shall comply with the CBC 2022, Title 24, Part 2, Section 11-B
- D. Exterior Room Identification Signs: Sign with smooth, uniform surfaces; with message and characters having uniform faces, corner rounded to radius indicated, and precisely formed lines and profiles; and as follows:
 1. Exterior Room Identification Sign: Color to contrast building background Monolithic tactile plaque constructed utilizing a single-piece which provides a fully homogeneous plaque sign. The sign body, face raised text and Braille are a single dimension component that results in a sign surface that exhibits a toughness that resists scratching, cracking, gouging and graffiti. Comply with characters and letters Regulatory Requirements above and the following requirements:
 - a. Sign Material 1/8 inch minimum, machined aluminum.
 - b. Sign sizes as indicated on the drawings with square corners and square edges.
 - c. Tactile character/symbols shall be raised 1/32 inch from sign face.
 - d. Provide raised copy signs.
 - e. Characters to be raised directly from message panel which produces evenly raised characters with clear well-define edges.
 - f. Signage shall be one piece, added on or engraved characters not acceptable.
 - g. All text shall be accompanied by California Contracted (Grade 2) Braille.
 - h. Provide two signs per exterior door. Each sign to bear a room number and up to 16 letter text. Refer to signage schedule and door schedule for additional information.
 - i. Signs shall comply with CBC 2022 Title 24, Part 2, Section 11B
 - j. Contrasting colors as indicated on the drawings.
- E. Toilet Room Signs:
 1. Interior: Provide 1/4-inch thick, photopolymer sheet with subsurface graphic international symbols for WOMEN and MEN and RESTROOM.
 2. Exterior; Provide 1/8-inch thick, machined aluminum sheet with graphic international symbols for WOMEN and MEN and RESTROOM.
 3. Locate as indicated on drawing (No Braille or raised Pictograms on doors signs). Sign color to contrast 70% with door leaf.

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4. For MEN provide a door-mounted 12-inch equilateral triangular sign per CBC 2022, Title 24, Part 2, Section 11B-703.7.2.6.1.
 5. For WOMEN provide a door mounted 12-inch diameter circular sign per CBC 2022 Title 24, Part 2, Section 11B-703.7.2.6.2.
 6. For UNISEX toilets provide a door-mounted sign consisting of a circle 1/4--inch thick and 12 inches in diameter, with a 1/4-inch -thick triangle, 12 inches in diameter, with a vertex pointing upward, superimposed on the circle. Triangle shall contrast in color with circle, and circle shall contrast 70% with door leaf. Entire background color of geometric symbol sign must contrast with door. Sign shall comply with CBC 2022, Title 24, Part 2, Section 11B-703.7.2.6.3.
 7. At toilets equipped for persons with disabilities, provide a wall mounted sign size 8 inches X 8 inches with 1/2-inch radius corners with separate 4-inch male and female pictograms and International Symbol of Accessibility pictogram, and California contracted Grade 2 Braille. Refer to drawings.
- F. Interior Message signs such as Occupancy Load Signs, and Assistive Listening Device signs: Sign with smooth , uniform surfaces: with message and characters having uniform faces, corners rounded to radius indicated, and precisely formed lines and profiles; and as follows:
1. Monolithic tactile plaque constructed utilizing a single-piece photopolymer which provides a fully homogeneous plaque sign. The sign body, face, text are a single dimensional component that results in a sign surface that exhibits a toughness that resists scratching, cracking, gouging and graffiti. Comply with Characters and letters Regulatory Requirements above and the following requirements:
 - a. Sign sizes: As indicated on the drawings
 - b. Material shall be non-glare single-piece photopolymer.
 - c. Contrasting colors as indicated on the drawings
 - d. Characters shall be visual without being raised..
 - e. Letter styles shall be Helvetica, Regular.
 - f. Signs shall comply with CBC 2022, Title 24, Part 2, Sections 11-B
- G. Sign Posts: Provide galvanized steel standard weight pipe posts. Comply with 2022 CBC, Title 24 and the Americans with Disabilities Act requirements.

2.4 PANEL-SIGN MATERIALS

- A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Photopolymer Sheet: moisture resistant, non-glare interior nylon photopolymer. Do not provide a PETG sign base. Provide single piece construction.
 1. Surface burning characteristics: Flame spread/smoke developed rating less than 75/120, tested to ASTM E84 and UL 723.
 2. Rate of burning: Tested to ASTM D635 at nominal 0,060 inch thickness with resulting Classification CC!.

3. Vertical burning: Tested to UL 94, classified as 94V-2 in thickness of 0.118 inch or greater and 94 HB in thicknesses less than 0.118 inch.
4. Self-ignition temperature: 800 degrees F (427 degrees C) tested to ASTM D129 Colored Coatings: Use Colored coatings, including inks and paints for copy and background colors that are recommended by manufacturers for optimum adherence to surface and are none fading for the application intended.

C. Steel Materials:

1. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, G90 coating, mill phosphatized either commercial or forming steel.
2. Steel Sheet: Uncoated, cold-rolled, ASTM A 1008/A 1008M, commercial steel, Type B, exposed] [or] [electrolytic zinc-coated, ASTM A 879/A 879M, Coating Designation 08Z, with steel-sheet substrate according to ASTM A 1008/A 1008M, commercial steel, exposed.
3. Steel Members Fabricated from Plate or Bar Stock: ASTM A 529/A 529M or ASTM A 572/A 572M, 42,000-psi minimum yield strength.
4. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.

D. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 316, stretcher-leveled standard of flatness.

2.5 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs noncorrosive and compatible with each material joined, and complying with the following:

1. For exterior exposure, stainless steel devices unless otherwise indicated..
2. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant Allen-head slots unless otherwise indicated.
3. Adhesive: Use liquid silicone adhesive as recommended by sign manufacturer.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.6 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs 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. Internally brace signs for stability and for securing fasteners.
 - 5. 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.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes'.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches as selected by the Architect from manufacturer's full range.
- E. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, Class I, 0.018-mm or thicker.
- B. Color Anodic Finish: AAMA 611, Class I, 0.018-mm or thicker.

- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

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. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that anchorage devices embedded in permanent construction are correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

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.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls as indicated on Drawings and according to accessibility standard.
- C. Mounting Methods:
 - 1. 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.

2. Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.
3. Wall Mount:
 - a. Mount to walls with four stainless steel tamper resistant screw anchors set in epoxy into solid wood blocking or into structural metal backing.
4. Hollow metal door Mounted Signage Panel:
 - a. Mount to door with four stainless steel tamper resistant screws.
5. Glazing Mounted Sign Panels: Attach sign panels to surfaces using methods indicated below:
 - a. Clear Double-Sided Tape: Provide industrial strength semi-permanent clear tape double sided tape fastening.
 - b. Size of the tape shall match the size and shape of the sign.
 - c. Do not provide screw holes in signs that will be mounted on glazing.
 - d. Provide finish on all sides of signs that will be mounted onto glazing.

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 District.

END OF SECTION 10 14 23

**SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Mirror with Stainless Frame
- B. Accessory Types:
 - 1. District Furnished / Contractor Installed Toilet Accessories (DFCI.)
 - 2. Contractor Furnished / Contractor Installed Toilet Accessories (CFCI.)

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

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.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.

- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) current edition.
- B. Regulatory Requirements: Install toilet and bath accessories per ADA-ABA and CBC Title 24 access requirements.
 - 1. Accessible toilet accessories shall be mounted at heights and at horizontal locations according to CBC Title 24.
 - 2. Toilet paper dispensers and feminine napkin disposal units located on the grab bar side of an accessible toilet room or stall shall not project more than 3-inches from the finished wall surface nor be located closer than 1-1/2-inch clear of the tangent point of the grab bar.

1.8 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include visible silver spoilage defects.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DISTRICT-FURNISHED CONTRACTOR-INSTALLED (DFCI) MATERIALS

- A. These materials will be provided by the District and installed by the General Contractor. Coordinate delivery of all materials with the District Construction Manager.
- B. District-Furnished Materials:

1. Liquid Soap Dispenser:
2. Paper Towel Dispenser:

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the CEC, by a qualified testing agency, and marked for intended location and application.

2.3 CONTRACTOR-FURNISHED CONTRACTOR-INSTALLED (CFCI) MATERIALS

- A. All of the Public-Use Washroom Accessories, Public-Use Shower Room Accessories, Warm Air Dryers, Under-lavatory Guards, and Custodial Accessories listed below are CFCI.

2.4 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

- B. Paper Towel (Folded) Dispenser **(Bobrick B-4262)**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
2. Mounting: Surface mounted.
3. Minimum Capacity: 400 C-fold or 525 multifold towels.
4. Material and Finish: Stainless-steel, No. 4 finish (satin).
5. Lockset: Tumbler type.
6. Refill Indicator: Pierced slots at sides or front.

- C. Liquid-Soap Dispenser: **(Bobrick B-2111)**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
2. Description: Designed for dispensing soap in liquid form.
3. Mounting: Vertically oriented, surface mounted -.Concealed/ vandal free
4. Capacity: 40 fluid oz.

TOILET, BATH, AND LAUNDRY ACCESSORIES

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DEHESA SCHOOL MODERNIZATION

5. Materials: Corrosion resistant valve, stainless steel lid for top filling.
6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

D. Recessed Toilet Tissue Dispenser (Bobrick B-6637) Kindergarten

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
2. Mounting: Recessed
3. Minimum Capacity: 2 standard toilet tissue rolls up to 5-1/4" dia.
4. Material and Finish: Type 304 stainless steel with satin finish
5. Lockset: Theft-resistant toilet tissue spindle (part no.283-604)

E. Recessed Multi-roll Toilet Tissue Dispenser (Bobrick B-4388)

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation
2. Mounting: Recessed
3. Minimum Capacity: Two standard toilet tissue rolls up to 5-1/4" dia.
4. Material and Finish: Type 304 stainless steel with satin finish
5. Lockset: Flush tumbler lock

F. Mirror with Stainless Steel Channel Frame (Bobrick B-165 Series)

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation
2. Mounting: Surface mount with locking devices secure mirror to concealed wall hanger. Mirror shall be removable from the wall.
3. Mirror Size: As indicated.
4. Materials and Finish: Type -430 stainless steel channel frame, with 90 degree mitered corners. Polished finish. Concealed wall hanger for snap locking design.
5. Mirror: No. 1 quality, 1/4 inch select float glass. Back is protected by full-size , shock absorbing, water-resistant, nonabrasive , polyethylene padding.

2.5 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

2.6 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to District Project Manager.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Provide backing/blocking for substrate to support accessory without additional material.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

SECTION 10 44 13
FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.
- B. Related Requirements:
 - 1. Section 10 44 16 "Fire Extinguishers."

1.3 PRE-INSTALLATION CONFERENCE

- A. Pre-installation Conference: Conduct conference at Project site a minimum of two weeks before the Work in this Section is to commence. Meeting maybe combined with Section 10 44 16.
 - 1. Review methods and procedures related to fire-protection cabinets, including:
 - a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed, semi-recessed, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.

- D. Product Schedule: For fire-protection cabinets. Provide recessed and surface mounted cabinets where indicated. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.5 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) and California Fire Code (CFC) current editions.
- B. Fire Extinguisher Cabinets must comply with CBC Sections 11B-305, 11B-307, 11B-308 and 11B-309.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.7 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Non-rated fire-Protection Cabinets

2.2 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - b. Larsens Manufacturing Company.
 - c. Potter Roemer LLC.
 - d. Or Equal.
- B. Cabinet Construction: Nonrated .

1. Non-Rated Cabinets: Provide manufacturer's standard nonrated extinguisher cabinets for surface and recessed mounting with factory-drilled mounting holes. Review locations for each type.
- C. Cabinet Material: Cold-rolled steel sheet.
 1. Rolled-Edge Trim: 2-1/2-inch backbend depth.
- D. Recessed Cabinet:
 1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
- E. Surface-Mounted Bracket: Bracket fully exposed and mounted directly on shear wall/s.
- F. Cabinet Trim Material: Steel sheet.
- G. Door Material: Steel sheet.
- H. Door Style: Fully glazed panel with frame.
- I. Door Glazing: Tempered float glass (clear).
- J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 1. Provide projecting door pull and friction latch operable with 5 lbs. maximum force.
 2. Provide continuous hinge of same material and finish as trim, permitting door to open 180 degrees.
- K. Accessories:
 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Pressure-sensitive vinyl letters.
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.
- L. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel or powder coat.
 - b. Color: Gloss white.
2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3-mm-thick, Class 1 (clear).

2.3 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2-inch-thick.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for cabinets to verify actual locations before cabinet installation.

- B. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
 - 1. Mount Fire Protection Cabinets to provide a handle height for both the Fire-Protection Cabinet and Fire Extinguisher at a maximum 48" above finished floor. The bottom of surface-mounted Fire Extinguisher Cabinets shall not exceed 27" above finished floor.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide semi-recessed fire-protection cabinets. If wall thickness is inadequate for semi-recessed cabinets, provide surface-mounted fire-protection cabinets.
 - 2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- C. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 13

SECTION 10 44 16
FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.
- B. Related Requirements:
 - 1. Section 10 44 13 "Fire Protection Cabinets."

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site a minimum of two weeks before Work of this Section is to commence. Meeting maybe combined with Section 10 44 13.
 - 1. Review methods and procedures related to fire extinguishers, including:
 - a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.7**1.8 COORDINATION**

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
- C. Comply with requirements of Title 19 C.C.R.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Amerex Corporation.
 - b. Ansul Incorporated; Tyco International.
 - c. Potter Roemer LLC.
 - d. Larsens Manufacturing Co.
 2. Valves: Manufacturer's standard.
 3. Handles and Levers: Manufacturer's standard.
 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 3-A:40-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS (Refer to Section 10 44 13 Fire Protection Cabinets)

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated; Tyco International.
 - c. Potter Roemer LLC.
 - d. Larsens Manufacturing Company
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mount Fire Extinguishers to provide handle height at a maximum of 48" above finish floor, and the bottom of the fire extinguisher is at a maximum of 27" above finish floor.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 44 16

**SECTION 11 30 13
RESIDENTIAL APPLIANCES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes: (O.F.O.I. Items)
 - 1. Microwave Oven.
 - 2. Refrigeration appliance.
 - 3. Dishwasher.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Electrical Appliances: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- B. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in the CBC, the DOJ's 2010 ADA Standards for Accessible Design, and the ABA standards of the Federal agency having jurisdiction.

2.2 MICROWAVE OVENS

- A. Microwave Oven
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. General Electric Company (GE Model #JES1657SMSS).
 - b. KitchenAid; a division of Whirlpool Corporation.
 - c. Maytag; a division of Whirlpool Corporation.
 - d. Or Equal.
 - 2. Mounting: As indicated.

3. Type: Conventional .
4. Capacity 1.6 cu. ft.
5. Oven Door: Door with observation window with pull handle and pushbutton latch release.
6. Microwave Power Rating: 1600 W.
7. Electric Power Supply: 120 V.
8. Controls: Digital panel controls and timer display.
9. Other Features: Turntable, automatic defrost, cooking complete reminder,
10. Material: Stainless-steel.
 - a. Color/Finish: Stainless-steel.

2.3 REFRIGERATOR/FREEZERS.

- A. Refrigerator/Freezer: Two-door, side-by-side refrigerator/freezer and complying with AHAM HRF-1.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. General Electric Company (GE Model #GSE25GYDFS).
 - b. KitchenAid; a division of Whirlpool Corporation.
 - c. Maytag; a division of Whirlpool Corporation.
 - d. Or Equal.
 2. Type: Freestanding
 3. Dimensions:
 - a. Width: 36 inches.
 - b. Depth: 34 3/4 inches.
 - c. Height 69 5/8 inches
 4. Storage Capacity:
 - a. Refrigeration Compartment Volume: 16.07 cu. ft.
 - b. Freezer Volume: 9.25 cu. ft.
 - c. Shelf Area: adjustable glass shelves per model.
 5. General Features:
 - a. Door Configuration: Double.
 - b. Built-in water-filtration system.
 - c. Dual refrigeration systems.
 - d. Separate temperature controls for each compartment.

6. Refrigerator Features:
 - a. Interior light in refrigeration compartment.
 - b. Compartment Storage: vegetable crisper and meat compartment.
 - c. Door Storage: Modular compartments
 - d. Temperature-controlled meat/deli bin.
7. Freezer Features: One freezer compartment with door.
 - a. Automatic defrost.
 - b. Interior light in freezer compartment.
 - c. Automatic icemaker and storage bin.
8. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
9. Front Panel(s): Stainless-steel.
10. Appliance Color/Finish: Stainless-steel.

2.4 DISHWASHERS

A. Dishwasher: Complying with AHAM DW-1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. General Electric Company (GE ADA Compliant Model # GDT225SSLSS).
 - b. KitchenAid; a division of Whirlpool Corporation.
 - c. LG Electronics.
2. Type: Built-in undercounter.
3. Dimensions:
 - a. Width: 23-3/4 inches.
 - b. Depth: 23-1/2 inches.
 - c. Height: 32-1/4 inches
4. Capacity:
 - a. Water Consumption for Full Load: 3.2-gal. per cycle.
5. Sound Level: Maximum 51 dBA.
6. Tub and Door Liner: Porcelain-enameled steel tub and molded-plastic door liner with sealed detergent and automatic rinsing-aid dispensers.
7. Rack System: PVC-coated full-extension sliding dish racks, with removable cutlery basket.
8. Controls: Touch-pad controls with four wash cycles and hot-air and heat-off drying cycle options.

9. Features:
 - a. Self-cleaning food-filter system.
 - b. Lock-out feature.
 - c. Half-load option.
 - d. Soft food disposer.
 - e. Sound-absorbing exterior insulation blanket around tub and back.
 - f. Self-cleaning food-filter system.
10. ENERGY STAR RATED: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
11. Front Panel: Stainless-steel.
12. Appliance Color/Finish: Stainless-steel.

END OF SECTION 11 31 00

SECTION 12 36 23.13
PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes plastic-laminate countertops.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including panel products, high-pressure decorative laminate and adhesive for bonding plastic laminate.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispenser, electrical switches and outlets and other items installed in plastic-laminate countertops.
 - 2. Apply WI Certified Compliance Program label to Shop Drawings.
- C. Samples for Initial Selection:
 - 1. Plastic laminates.
- D. Samples for Verification:
 - 1. Plastic laminates, 12-by-12 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. Wood-grain plastic laminates, 12-by-24 inches, for each type, pattern and surface finish, with one sample applied to core material and specified edge material applied to one edge.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.

- B. Product Certificates: For the following:
 - 1. Composite wood and agrifiber products.
 - 2. High-pressure decorative laminate.
 - 3. Adhesives.
- C. Woodwork Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.

1.5 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.
- B. Installer Qualifications: Fabricator of products.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install countertops 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. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg. F and relative humidity between 17 and 50 percent during the remainder of the construction period.
- C. Field Measurements: Where countertops 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.
- D. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS**2.1 PLASTIC-LAMINATE COUNTERTOPS**

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
 - 1. Provide labels and certificates from WI certification program indicating that countertops, including installation, comply with requirements of grades specified.
 - 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Custom.
- C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Formica Corporation. **(Basis of Design)**
 - b. Nevamar; a Panolam Industries International, Inc. brand.
 - c. Wilsonart LLC.
 - d. Or Equal.
- D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated by manufacturer's designations.
 - 2. As selected by Architect from manufacturer's full range in the following categories:
 - a. Color: As indicated in Finish Legend
 - b. Finish: Matte Finish
 - 3. Grain Direction: Parallel with countertop length
- E. Edge Profile: Square, self-edge.
- F. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- G. Splash Profile: As indicated on Drawings. Splash shall be 4-inches high.
- H. Core Material: Exterior-grade plywood.
- I. Core Material at Sinks: Exterior-grade plywood.

PLASTIC-LAMINATE-CLAD COUNTERTOPS**12 36 23.13 - 3****DEHESA SCHOOL MODERNIZATION**

- J. Core Thickness: 3/4 inch.
 - 1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.
- K. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
 - 1. Wood Moisture Content: 4 to 9 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Softwood Plywood: DOC PS 1.

2.3 ACCESSORIES

- A. Grommets for Cable Passage through Countertops: 2-inch, satin chrome color, molded-plastic grommets and matching plastic caps with slot for wire passage.

2.4 MISCELLANEOUS MATERIALS

- A. Adhesive for Bonding Plastic Laminate: Contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

- A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1-inch over base cabinets. Ease edges to radius indicated for the following:
 - 1. Solid-Wood (Lumber) Members: 1/16-inch unless otherwise indicated.
- B. Complete fabrication, including assembly, 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.

PLASTIC-LAMINATE-CLAD COUNTERTOPS

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DEHESA SCHOOL MODERNIZATION

1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, 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.
 1. Seal edges of openings in countertops with a coat of varnish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.
- B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
- C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
 1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8-inch in 96 inches.

PLASTIC-LAMINATE-CLAD COUNTERTOPS

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DEHESA SCHOOL MODERNIZATION

- E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Install countertops with no more than 1/8-inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 - 3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean countertops on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 12 36 23.13

SECTION 12 36 61.16**SOLID SURFACING COUNTERTOPS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid surface material countertops.
 - 2. Solid surface material backsplashes.
 - 3. Solid surface material end splashes.
 - 4. Solid surface material apron fronts.
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications" for supports.
 - 2. Section 07 92 00 "Joint Sealants" for installation
 - 3. Section 22 42 16.16 "Commercial Sinks"

1.3 ACTION SUBMITTALS

- A. Product Data: For countertop materials and sinks if indicated.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- C. Samples for Initial Selection: For each type of material exposed to view.
- D. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches (150 mm) square.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops like that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.
- C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
 - 1. Build mockup of typical countertop as shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.8 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

1.9 REGULATORY REQUIREMENTS

- A. Comply with California Building Code (CBC) 2022

PART 2 - PRODUCTS**2.1 SOLID SURFACE COUNTERTOP MATERIALS**

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Avonite Surfaces. (Basis of Design)
 - 1) Product: Avonite (Alpine Shimmer 8206)
 - b. Or equal
 2. Type: Provide Standard type unless Special Purpose type is indicated.
 3. Sinks: Provide shop cutout for specified sink
 4. Colors and Patterns: As indicated.
- B. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue/Marine Glue for wet areas.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
1. Grade: Custom
- B. Configuration: As indicated
1. Backsplash: Straight, slightly eased at corner
 2. End Splash: Matching backsplash.
- C. Countertops: 3/4-inch- (19-mm-) thick, solid surface material with front edge built up with same material.
- D. Backsplashes: 1/2-inch- (12.7-mm-) thick, solid surface material. Height as indicated.
- E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
1. Fabricate with loose backsplashes for field assembly.
 2. Install integral sink bowls if indicated in countertops in the shop.
- F. Joints: Fabricate countertops without joints.
- G. Joints: Fabricate countertops in sections for joining in field
1. Joint Locations: Not within 18 inches (450 mm) of a sink and not where a countertop section less than 36 inches (900 mm) long would result, unless unavoidable.
 2. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints. Make width of cuts slightly more than thickness of splines to provide snug fit. Provide at least three splines in each joint.

H. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.
 - b. Coordinate manufacturer cutout templates specified sink fixture and similar items indicated.
2. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items as indicated.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer. Product must be low VOC compliant.
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m maximum and as indicated in the drawings. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with

manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

- C. Fasten sub-tops to support as indicated. Shim as needed to align sub-tops in a level plane.
- D. Secure countertops to subtops with adhesive and screws according to solid surface material manufacturer's written instructions.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION 12 36 61.16

SECTION 22 05 00**COMMON WORK RESULTS FOR PLUMBING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Escutcheons.
- B. Product data.

PART 2 - PRODUCTS**2.1 ESCUTCHEONS**

- A. Escutcheon Types:
 - 1. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.
 - 2. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.
 - 3. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed and exposed-rivet hinge; and spring-clip fasteners.

PART 3 - EXECUTION**3.1 INSTALLATION OF ESCUTCHEONS**

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

3.2 FIELD QUALITY CONTROL

- A. Escutcheons:
 - 1. Using new materials, replace broken and damaged escutcheons.

3.3 ESCUTCHEONS APPLICATION**A. Escutcheons for New Piping and Relocated Existing Piping:**

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Chrome-Plated Piping: One piece, steel with polished, chrome-plated finish.
3. Insulated Piping:
 - a. One piece, steel with polished, chrome-plated finish.

END OF SECTION 22 05 00

SECTION 22 07 19**PLUMBING PIPING INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic hot-water piping.
 - 2. Supplies and drains for handicap-accessible lavatories and sinks.

1.2 ACTION SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.4 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.
 - 1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Flexible Elastomeric: Closed-cell or expanded-rubber materials; suitable for maximum use temperature between minus 70 deg F and 220 deg F Comply with ASTM C534/C534M, Type I for tubular materials.
- D. Glass-Fiber, Preformed Pipe: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 850 deg F (454 deg C) in accordance with ASTM C411. Comply with ASTM C547.
 - 1. Preformed Pipe Insulation: Type I, Grade A, with factory-applied ASJ+ jacket with factory-applied PSK jacket.
 - 2. Fabricated shapes in accordance with ASTM C450 and ASTM C585.
 - 3. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Solvent-based adhesive.
 - 1. Flame-spread index shall be 25 or less and smoke-developed index shall be 50 or less as tested in accordance with ASTM E84.
 - 2. Wet Flash Point: Below 0 deg F.
 - 3. Service Temperature Range: 40 to 200 deg F.
 - 4. Color: Black.

2.4 MASTICS AND COATINGS

- A. Materials shall be compatible with insulation materials, jackets, and substrates.

2.5 SEALANTS

- A. Materials shall be as recommended by the insulation manufacturer and shall be compatible with insulation materials, jackets, and substrates.
- B. Joint Sealants:
 - 1. Permanently flexible, elastomeric sealant.

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.

2.7 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.
 - 1. Width: 3 inches .
 - 2. Thickness: 11.5 mils .
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.8 SECUREMENTS

- A. Wire: 0.062-inch soft-annealed, galvanized steel.

2.9 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers:
 - 1. Description: Manufactured plastic wraps for covering plumbing fixture hot-water supply hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.
- B. Protective Shielding Piping Enclosures:
 - 1. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Carbon Steel: Coat carbon steel operating at a service temperature of between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

- C. Coordinate insulation installation with the tradesman installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.
- D. Install insulation with longitudinal seams at top and bottom (12 o'clock and 6 o'clock positions) of horizontal runs.
- E. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with the contract documents..
- F. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- G. Install insulation with least number of joints practical.
- H. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward-clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward-clinching staples along edge at 4 inches o.c.
 - 4. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- I. Cut insulation in a manner to avoid compressing insulation.
- J. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

- K. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.

3.3 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles below.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.

3.4 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
 - 1. Install pipe insulation to outer diameter of pipe flange.
 - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as that of pipe insulation.
 - 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install sections of pipe insulation and miter if required in accordance with manufacturer's written instructions.
 - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.5 INSTALLATION OF GLASS-FIBER AND MINERAL WOOL INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
 - 1. Secure each layer of preformed pipe insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
2. When prefabricated insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

3.6 PIPING INSULATION SCHEDULE, GENERAL

- A.** Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated:** Unless otherwise indicated, do not install insulation on the following:
1. Drainage piping located in crawl spaces.
 2. Underground piping.
 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.7 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot Water:

1. NPS 1 and Smaller: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 3/4 inch thick.
 - b. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

END OF SECTION 22 07 19

SECTION 22 11 16
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings - domestic water.

1.2 ACTION SUBMITTALS

A. Product data.

1.3 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Domestic water piping, tubing, fittings, joints, and appurtenances intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act, with requirements of authorities having jurisdiction, and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.**

2.2 PIPING MATERIALS

- A. Potable-water piping and components are to comply with NSF 14, NSF 61, and NSF 372**

2.3 COPPER TUBE AND FITTINGS - DOMESTIC WATER

- A. Drawn-Temper Copper Tube: ASTM B88, Type L .**
- B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings. Do not use solder joints on pipe sizes greater than NPS 4 .**

- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings. Do not use solder joints on pipe sizes greater than NPS 4 .

2.4 PIPING JOINING MATERIALS - DOMESTIC WATER

- A. Solder Filler Metals: ASTM B32, lead-free alloys.
- B. Flux: ASTM B813, water flushable.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Aboveground domestic water piping, NPS 2 (DN 50) and smaller is to be the following:
 - 1. Drawn-temper copper tube, ASTM B88, Type L wrought-copper, solder-joint fittings; and soldered joints.

3.2 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- E. Install piping free of sags and bends.
- F. Install fittings for changes in direction and branch connections.

DOMESTIC WATER PIPING

22 11 16 - 2

DEHESA SCHOOL MODERNIZATION

- G. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings in accordance with ASTM B828 or CDA's "Copper Tube Handbook."
 - 1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.

3.4 PIPING CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

3.5 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation.

3.6 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
 - 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system in accordance with either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.

- c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.7 ADJUSTING

- A. Perform the following adjustments before operation:
 - 1. Open angle stops at sinks to fully open position.

END OF SECTION 22 11 16

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Hubless, cast-iron soil pipe and fittings.
 - 2. ABS pipe and fittings.
 - 3. Specialty pipe fittings.

1.2 ACTION SUBMITTALS

- A. Product data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation are capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10 ft. head of water.

2.2 PIPING MATERIALS

- A. Piping materials to bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings:
 - 1. Marked with CISPI collective trademark.
 - 2. ASTM A888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
 - 1. Standards: ASTM C1277 and CISPI 310.

2. Description: Stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.
- C. Heavy-Duty, Hubless-Piping Couplings:
 1. Standards: ASTM C1277 and ASTM C1540 .
 2. Description: Stainless steel shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

2.4 ABS PIPE AND FITTINGS

- A. NSF Marking: Comply with NSF 14 for plastic piping components. Include "NSF-dwv" marking for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- B. Solid-Wall ABS Pipe: ASTM D2661, Schedule 40.
- C. ABS Socket Fittings: ASTM D2661, made in accordance with ASTM D3311, drain, waste, and vent patterns.
- D. Solvent Cement: ASTM D2235.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
 1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
 2. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping free of sags and bends.
- F. Install fittings for changes in direction and branch connections.

- G. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
 - 1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
 - 2. Use long-turn, double Y-branch, and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
 - a. Straight tees, elbows, and crosses may be used on vent lines.
 - 3. Do not change direction of flow more than 90 degrees.
 - 4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - a. Reducing size of waste piping in direction of flow is prohibited.
- H. Install cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- I. Install aboveground ABS piping in accordance with ASTM D2661.
- J. Install underground ABS piping in accordance with ASTM D2321.
- K. Install escutcheons for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.2 JOINT CONSTRUCTION

- A. Hubless, Cast-Iron Soil Piping Coupled Joints:
 - 1. Join hubless, cast-iron soil piping in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- B. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:
 - 1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join in accordance with ASTM D2235 and ASTM D2661 appendixes.

3.3 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

- C. Connect waste and vent piping to the following:
 - 1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
- D. Make connections in accordance with the following unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

3.4 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

3.5 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed ABS Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.
- E. Repair damage to adjacent materials caused by waste and vent piping installation.

3.6 PIPING SCHEDULE

- A. Aboveground, soil and waste piping NPS 4 and smaller are to be the following:
 - 1. Service Class cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Hubless, cast-iron soil pipe and fittings heavy-duty hubless-piping couplings; and coupled joints.
 - 3. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
 - 4. END OF SECTION 22 13 16

SECTION 22 42 16.16**COMMERCIAL SINKS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Kitchen/utility sinks.
 - 2. Manually operated sink faucets.
 - 3. Supply fittings.
 - 4. Waste fittings.
 - 5. Sink supports.
 - 6. Grout.

1.2 ACTION SUBMITTALS

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

1.3 ACCESSIBILITY

- A. Minimum requirements:
 - 1. Accessible plumbing fixtures shall comply with all the requirements in CBC Chapter 11B, Division 6.
 - 2. Heights and locations of all accessible plumbing fixtures and components shall be mounted according to CBC Sections 11B-602 through 11B-612.
 - 3. Accessible fixture controls shall comply with 11B-606.4 for lavatories and sinks.
 - 4. Accessible lavatories and sinks shall be mounted with the front of the higher of the rim or counter surface 34" maximum above the finish floor or ground. Depth of lavatories or sinks shall not interfere with knee and toe clearance provided in accordance with CBC Section 11B-306 when a forward approach is required. CBC Sections 11B-606.3 and 11B-606.7.
 - 5. Water supply and drainpipes under accessible lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under accessible lavatories and sinks. CBC Section 11B-606.5.

PART 2 - PRODUCTS**2.1 KITCHEN/UTILITY SINKS**

- A. Kitchen/Utility Sinks - Stainless Steel, Counter Mounted:

1. Fixture:
 - a. Standard: ASME A112.19.3/CSA B45.4.
 - b. Type: Stainless steel, self-rimming, sound-deadened unit with ledge back.
 - c. Number of Compartments: One.
 - d. Overall Dimensions: See Drawing Schedule .
 - e. Material: 18 gauge, Type 304 stainless steel.
 - f. Compartment:
 - 1) Dimensions: See Drawing Schedule .
 - 2) Drain: Grid with NPS 1-1/2 Drain .
 - 3) Drain Location: Near back of compartment .
 - 4) Depth: Wheelchair accessible.
2. Faucet(s): See "Manually Operated Sink Faucets > .
 - a. Number Required: One .
 - b. Mounting: On ledge.
3. Supply Fittings:
 - a. Standard: ASME A112.18.1/CSA B125.1.
 - b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.
 - 1) Operation: Loose key .
 - 2) Risers: NPS 1/2 (DN 15), braided or corrugated stainless steel flexible hose.
4. Waste Fittings:
 - a. Standard: ASME A112.18.2/CSA B125.2.
 - b. Trap(s):
 - 1) Size: NPS 1-1/2.
 - 2) Material:
 - a) Chrome-plated, two-piece, cast-brass trap and swivel elbow with 17-gauge brass tube to wall ; and chrome-plated brass or steel wall flange.
 - b) Stainless steel, two-piece trap and swivel elbow with 0.012 inch (0.30 mm) thick stainless steel tube to wall; and stainless steel wall flange.
5. Mounting: On counter with sealant.

2.2 MANUALLY OPERATED SINK FAUCETS

- A. Sink faucets intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.
- B. Commercial Sink Faucets - Manual Type..
 - 1. Standard: ASME A112.18.1/CSA B125.1.
 - 2. Body Type: See Drawing Schedule.
 - 3. Body Material: Commercial, solid brass.
 - 4. Finish: **Polished chrome plate**.
 - 5. Maximum Flow Rate: 1.5 gpm.
 - 6. Mounting Type: Deck, concealed.
 - 7. Valve Handle(s): See Drawing Schedule.
 - 8. Spout Type: See Drawing.
 - 9. Spout Outlet: Aerator.

2.3 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless steel wall flange.
- D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- E. Operation: Loose key.
- F. Risers:
 - 1. NPS 1/2).
 - 2. ASME A112.18.6/CSA B125.6, braided or corrugated stainless steel flexible hose.

2.4 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.
- C. Trap:

1. Size: NPS 1-1/2.
2. Material:
 - a. Chrome-plated, two-piece, cast-brass trap and swivel elbow with 17-gauge brass tube to wall; and chrome-plated brass or steel wall flange.

2.5 GROUT

- A. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000 psi (34.5 MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install sinks level and plumb in accordance with rough-in drawings.
- B. Install water-supply piping with stop on each supply to each sink faucet.
- C. Install escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."
- D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.2 PIPING CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.3 ADJUSTING

- A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

3.4 CLEANING AND PROTECTION

- A. After completing installation of sinks, inspect and repair damaged finishes.
- B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed sinks and fittings.
- D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 42 16.16

SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS**2.1 EQUIPMENT LABELS**

- A. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: Black.
 - 3. Background Color: White.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24

inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

7. Fasteners: Stainless-steel rivets or self-tapping screws.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

END OF SECTION 23 05 53

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.
 - 2. Testing, Adjusting, and Balancing Equipment:
 - 3. Duct leakage tests.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation system.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- G. TDH: Total dynamic head.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to

Proceed, submit the Contract Documents review report as specified in Part 3.

- C. Certified TAB reports.
- D. Sample report forms.
- E. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration.

1.5 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by NEBB or TABB.
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.
 - 2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB as a TAB technician.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

1.6 FIELD CONDITIONS

- A. Partial District Occupancy: District may occupy completed areas of building before Substantial Completion. Cooperate with District during TAB operations to minimize conflicts with District's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.
- K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- L. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system

readiness for TAB work. Include, at a minimum, the following:

1. Airside:
 - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
 - b. Duct systems are complete with terminals installed.
 - c. Volume, smoke, and fire dampers are open and functional.
 - d. Clean filters are installed.
 - e. Fans are operating, free of vibration, and rotating in correct direction.
 - f. Variable-frequency controllers' startup is complete and safeties are verified.
 - g. Automatic temperature-control systems are operational.
 - h. Ceilings are installed.
 - i. Windows and doors are installed.
 - j. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier,
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

- E. Verify that motor starters are equipped with properly sized thermal protection.
- F. Check dampers for proper position to achieve desired airflow path.
- G. Check for airflow blockages.
- H. Check condensate drains for proper connections and functioning.
- I. Check for proper sealing of air-handling-unit components.
- J. Verify that air duct system is sealed as specified in Section 23 31 13 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
 - 2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
 - 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions..
 - 4. Obtain approval from commissioning authority for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 - 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to

indicated airflows.

1. Measure airflow of submain and branch ducts.
 2. Adjust submain and branch duct volume dampers for specified airflow.
 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 2. Measure inlets and outlets airflow.
 3. Adjust each inlet and outlet for specified airflow.
 4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
 2. Re-measure and confirm that total airflow is within design.
 3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
 4. Mark all final settings.
 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
 6. Measure and record all operating data.
 7. Record final fan-performance data.

3.6 PROCEDURES FOR MOTORS

- A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer's name, model number, and serial number.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Phase and hertz.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter size and thermal-protection-element rating.
 8. Service factor and frame size.
- B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.
- C. Verify proper rotation of fans.
- D. Measure entering- and leaving-air temperatures.
- E. Record fan and motor operating data.

3.7 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Measure, adjust, and record the following data for each water coil:
- B. Measure, adjust, and record the following data for each refrigerant coil:
 - 1. Dry-bulb temperature of entering and leaving air.
 - 2. Wet-bulb temperature of entering and leaving air.
 - 3. Airflow.

3.8 DUCT LEAKAGE TESTS

- A. Witness the duct pressure testing performed by Installer.
- B. Verify that proper test methods are used and that leakage rates are within specified tolerances.
- C. Report deficiencies observed.

3.9 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 - 2. Air Outlets and Inlets: Plus or minus 10 percent.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.10 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
 - 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Fan curves.
 - 2. Manufacturers' test data.
 - 3. Field test reports prepared by system and equipment installers.
 - 4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
 2. Name and address of the TAB specialist.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Duct, outlet, and inlet sizes.
 3. Terminal units.
 4. Balancing stations.
 5. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.

- e. Manufacturer's serial number.
- f. Unit arrangement and class.
- g. Discharge arrangement.
- h. Sheave make, size in inches, and bore.
- i. Center-to-center dimensions of sheave and amount of adjustments in inches.
- j. Number, make, and size of belts.
- k. Number, type, and size of filters.

2. Motor Data:

- a. Motor make, and frame type and size.
- b. Horsepower and rpm.
- c. Volts, phase, and hertz.
- d. Full-load amperage and service factor.
- e. Sheave make, size in inches, and bore.
- f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

- a. Total airflow rate in cfm.
- b. Total system static pressure in inches wg.
- c. Fan rpm.
- d. Discharge static pressure in inches wg.
- e. Filter static-pressure differential in inches wg.
- f. Preheat-coil static-pressure differential in inches wg.
- g. Cooling-coil static-pressure differential in inches wg.
- h. Heating-coil static-pressure differential in inches wg.
- i. Outdoor airflow in cfm.
- j. Return airflow in cfm.
- k. Outdoor-air damper position.
- l. Return-air damper position.
- m. Vortex damper position.

F. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

- a. System and air-handling-unit number.
- b. Location and zone.
- c. Traverse air temperature in deg F.
- d. Duct static pressure in inches wg.
- e. Duct size in inches.
- f. Duct area in sq. ft..
- g. Indicated airflow rate in cfm.
- h. Indicated velocity in fpm.
- i. Actual airflow rate in cfm.
- j. Actual average velocity in fpm.
- k. Barometric pressure in psig.

G. Instrument Calibration Reports:

1. Report Data:

- a. Instrument type and make.
- b. Serial number.
- c. Application.
- d. Dates of use.
- e. Dates of calibration.

3.11 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of commissioning authority.
- B. Commissioning authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 2. If the second final inspection also fails, District may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
- F. Prepare test and inspection reports.

END OF SECTION 23 05 93

SECTION 23 07 13 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, exposed supply and outdoor air.
 - 3. Indoor, concealed return located in unconditioned space.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
 - 3. Detail application of field-applied jackets.
 - 4. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS**2.1 INSULATION MATERIALS.**

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Adhesive shall comply with the testing and product requirements of San Diego Air Pollution Control District Rule 67.0 "Architectural Coatings" and Rule 67.21 "Adhesive Material Application Operations."
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. Adhesive shall comply with the testing and product requirements of San Diego Air Pollution Control District Rule 67.0 "Architectural Coatings" and Rule 67.21 "Adhesive Material Application Operations."

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 - 1. Mastics shall comply with the testing and product requirements of San Diego Air Pollution Control District Rule 67.0 "Architectural Coatings" and Rule 67.21 "Adhesive Material Application Operations."
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
4. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: 60 percent by volume and 66 percent by weight.
4. Color: White.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Lagging adhesives shall comply with the testing and product requirements of San Diego Air Pollution Control District Rule 67.0 "Architectural Coatings" and Rule 67.21 "Adhesive Material Application Operations."
2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
3. Service Temperature Range: 0 to plus 180 deg F.
4. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. Sealants shall comply with the testing and product requirements of San Diego Air Pollution Control District Rule 67.0 "Architectural Coatings."

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Glass-Fiber Fabric: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. in. for covering ducts.
- B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for ducts.

2.8 FIELD-APPLIED CLOTHS

- A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd.

2.9 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. Thickness is indicated in field-applied jacket schedules.
 1. Adhesive: As recommended by jacket material manufacturer.
 2. Color: Color-code jackets based on system. Color as selected by Architect.
- D. Self-Adhesive Outdoor Jacket: 60-mil-thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross laminated polyethylene film covered with white aluminum-foil facing.

2.10 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 1. Width: 3 inches.
 2. Thickness: 6.5 mils.
 3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.11 SECUREMENTS

A. Bands:

1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing seal or closed seal.
2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated.
2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

D. Wire: 0.080-inch nickel-copper alloy.

2.12 CORNER ANGLES

- A. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.
- B. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
1. Comply with requirements in Section 07 84 13 "Penetration Firestopping" and fire-resistive joint sealers.
- E. Insulation Installation at Floor Penetrations:
1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

- d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

- d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
- 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
- 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
- 6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
 - 1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 - 2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
 - 3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where FSK jackets are indicated, install as follows:
 - 1. Draw jacket material smooth and tight.
 - 2. Install lap or joint strips with same material as jacket.
 - 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 - 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
 - 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by District, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 DUCT INSULATION SCHEDULE, GENERAL

- A. Portions of supply-air and return air ducts conveying heated or cooled air located in one or more of the following spaces shall be insulated to a minimum installed level of R-8:
 - 1. Outdoors (lined ductwork with minimum R-8), or
 - 2. In a space between the roof and an insulated ceiling , or
 - 3. In a space directly under a roof with fixed vents or openings to the outside or unconditioned spaces, or
 - 4. In an unconditioned crawlspace, or
 - 5. In other unconditioned spaces.
- B. Portions of supply-air ducts that are not in one of these spaces, including ducts buried in concrete slab, shall be insulated to a minimum installed level of R-4.2 (or any higher level required by CMC Section 605.0) or be enclosed in directly conditioned space.

END OF SECTION 23 07 13

SECTION 23 31 13 - METAL DUCTS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:

- 1. Single-wall rectangular ducts and fittings.
 - 2. Single-wall round ducts and fittings.
 - 3. Sheet metal materials.
 - 4. Duct liner.
 - 5. Sealants and gaskets.
 - 6. Hangers and supports.

- B. Related Sections:

- 1. Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
 - 2. Section 23 33 00 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:

- 1. Liners and adhesives.
 - 2. Sealants and gaskets.
 - 3. Seismic-restraint devices.

- B. Shop Drawings:

- 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Factory- and shop-fabricated ducts and fittings.
 - 3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
 - 4. Elevation of top of ducts.

5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
- 9.
10. Penetrations through fire-rated and other partitions.
11. Equipment installation based on equipment being used on Project.
12. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
13. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
 2. Suspended ceiling components.
 3. Structural members to which duct will be attached.
 4. Size and location of initial access modules for acoustical tile.
 5. Penetrations of smoke barriers and fire-rated construction.
 6. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC

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Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).
- C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 - 2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
- E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction

Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- 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.

2.4 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
 - 1. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 - 2. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
- B. Insulation Pins and Washers:
 - 1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick stainless steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
 3. Butt transverse joints without gaps, and coat joint with adhesive.
 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
 6. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
 7. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

2.5 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 2. Tape Width: 4 inches
 3. Sealant: Modified styrene acrylic.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 7. Service: Indoor and outdoor.
 8. Service Temperature: Minus 40 to plus 200 deg F.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare),

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stainless steel, or aluminum.

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel,

and bolts designed for duct hanger service; with an automatic-locking and clamping device.

- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 - 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 23 33 00 "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Outdoor, Supply-Air Ducts: Seal Class A.
 - 3. Outdoor, Exhaust Ducts: Seal Class C.
 - 4. Outdoor, Return-Air Ducts: Seal Class C.
 - 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
 - 6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
 - 7. Unconditioned Space, Exhaust Ducts: Seal Class C.
 - 8. Unconditioned Space, Return-Air Ducts: Seal Class B.
 - 9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 - 10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
 - 11. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 12. Conditioned Space, Return-Air Ducts: Seal Class C.
- B. New building 400 duct systems shall be sealed to a leakage rate not to exceed 6

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percent of the nominal air handler airflow rate as confirmed through field verification and diagnostic testing, in accordance with the applicable procedures in the 2016 California Energy Code Reference Nonresidential Appendices NA1 and NA2.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 23 33 00 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not

have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual" for all duct systems over 3 in wg. Submit a test report for each test.
- C. Duct System Cleanliness Tests:
 - 1. Visually inspect duct system to ensure that no visible contaminants are present.
 - 2. Test sections of metal duct system, chosen randomly by District, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
- D. Duct system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.8 DUCT CLEANING

- A. Clean new and existing duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 23 33 00 "Air Duct Accessories" for access panels and doors.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
 - 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 - 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 START UP

- A. Air Balance: Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

3.10 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated.

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
 - a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: C.

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- c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12 .
 - 2. Ducts Connected to Constant-Volume Air-Handling Units:
 - a. Pressure Class: Positive 3-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
- C. Return Ducts:
 - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
 - 2. Ducts Connected to Air-Handling Units:
 - a. Pressure Class: Positive or negative 3-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
- D. Intermediate Reinforcement:
 - 1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.
 - 2. Stainless-Steel Ducts:
 - a. Exposed to Airstream: Match duct material.
 - b. Not Exposed to Airstream: Match duct material.
 - 3. Aluminum Ducts: Aluminum or galvanized sheet steel coated with zinc chromate.
- E. Liner:
 - 1. Supply Air Ducts: Fibrous glass, Type I, Installed R-8 insulation.
 - 2. Return Air Ducts: Fibrous glass, Type I, Installed R-8 insulation.
 - 3. Supply Fan Plenums: Fibrous glass, Type II, Installed R-8 insulation.
 - 4. Return-Fan Plenums: Fibrous glass, Type II, Installed R-8 insulation.
 - 5. Transfer Ducts: Fibrous glass, Type I, Installed R-8 insulation.
- F. Elbow Configuration:
 - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

- a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
- a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

END OF SECTION 23 31 13

SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Manual volume dampers.
 - 2. Turning vanes.
 - 3. Remote Damper Operators
 - 4. Flexible connectors.
 - 5. Flexible ducts.
 - 6. Duct accessory hardware.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
 - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- C. Comply with AMCA 500-D testing for damper rating.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and exposed ducts.
- C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. 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 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McGill AirFlow LLC.
 - b. Nailor Industries, Inc.
 - c. Ruskin Company.
 - d. Or equal.
 - 2. Standard leakage rating, with linkage outside airstream.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:
 - a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 5. Blades:

- a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized steel, 0.064 inch thick.
- 6. Blade Axles: Galvanized steel.
- 7. Bearings:
 - a. Molded synthetic or Stainless-steel sleeve.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
- 8. Tie Bars and Brackets: Galvanized steel.

2.4 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ductmate Industries, Inc.
 - 2. METALAIRE, Inc.
 - 3. SEMCO Incorporated.
 - 4. Or equal.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- D. Vane Construction: Double wall.
- E. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.5 REMOTE DAMPER OPERATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Pottorff; a division of PCI Industries, Inc.
 - 2. Ventfabrics, Inc.
 - 3. Young Regulator Company.

- B. Description: Cable system designed for remote manual damper adjustment.
- C. Tubing: Brass.
- D. Cable: Stainless steel.
- E. Wall-Box Mounting: Recessed, 3/4 inches (19 mm) deep or Surface, coordinate with Architect.
- F. Wall-Box Cover-Plate Material: Steel or Stainless steel; Coordinate finish with Architect.

2.6 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ductmate Industries, Inc.
 - 2. Ventfabrics, Inc.
 - 3. Ward Industries; a brand of Hart & Cooley, Inc.
 - 4. Or Equal.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd..
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
 - 1. Minimum Weight: 24 oz./sq. yd..
 - 2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
 - 3. Service Temperature: Minus 50 to plus 250 deg F.
- G. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
 - 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.

2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.7 FLEXIBLE DUCTS

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

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries; a brand of Hart & Cooley, Inc.
4. Or equal.

- B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 175 deg F.
4. Insulation R-Value: Comply with California Energy Code.

- C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.
2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

2.8 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install 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 volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Label access doors according to Section 23 05 53 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- G. Install flexible connectors to connect ducts to equipment.
- H. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- I. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- J. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- K. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.
- L. Install duct test holes where required for testing and balancing purposes.
- M. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.

2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

SECTION 233423 - HVAC POWER VENTILATORS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Ceiling-mounted ventilators.

1.3 ACTION SUBMITTALS

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

- 1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for fans.
 - 2. Rated capacities, operating characteristics, and furnished specialties and accessories.
 - 3. Certified fan performance curves with system operating conditions indicated.
 - 4. Certified fan sound-power ratings.
 - 5. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 6. Material thickness and finishes, including color charts.
 - 7. Dampers, including housings, linkages, and operators.
 - 8. Fan speed controllers.

- B. Shop Drawings:

- 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, or BIM model, drawn to scale, showing the items described in this Section and coordinated with all building trades.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For HVAC power ventilators to include in normal and emergency operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Capacities and Characteristics: Refer to Mechanical Schedules.

2.2 CEILING-MOUNTED VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Greenheck Fan Corporation.
 - 2. Loren Cook Company.
 - 3. PennBarry; division of Air System Components.
- B. Housing: Steel, lined with acoustical insulation.
- C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel removable for service.
- D. Back-draft damper: Integral.
- E. Grille: Aluminum Painted aluminum, louvered grille with flange on intake and thumbscrew or spring retainer attachment to fan housing.
- F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.
- G. Accessories:
 - 1. Variable-Frequency Motor Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
 - 3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
 - 4. Motion Sensor: Motion detector with adjustable shutoff timer.
 - 5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless steel springs, and fusible link.
 - 6. Filter: Washable aluminum to fit between fan and grille.
 - 7. Isolation: Rubber-in-shear vibration isolators.
 - 8. Manufacturer's standard roof jack or wall cap, and transition fittings.

2.3 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors.
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

PART 3 - EXECUTION**3.1 INSTALLATION, GENERAL**

- A. Install power ventilators level and plumb.
- B. Equipment Mounting:
 - 1. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
- C. Install units with clearances for service and maintenance.
- D. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 DUCTWORK CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

3.3 STARTUP SERVICE:

- A. Perform startup service.
 - 1. Complete installation and startup checks in accordance with manufacturer's written instructions.
 - 2. Verify that shipping, blocking, and bracing are removed.
 - 3. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 4. Verify that cleaning and adjusting are complete.
 - 5. For direct-drive fans, verify proper motor rotation direction and verify fan wheel free rotation and smooth bearing operation.
 - 6. Verify lubrication for bearings and other moving parts.
 - 7. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 - 8. Shut unit down and reconnect automatic temperature-control operators.
 - 9. Remove and replace malfunctioning units and retest as specified above.

SUMMARY**POWER VENTILATORS 23 34 23 - 3
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3.4 ADJUSTING

- A. Lubricate bearings.
- B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.5 CLEANING

- A. After completing system installation and testing, adjusting, and balancing and after completing startup service, clean fans internally to remove foreign material and construction dirt and dust.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Test and adjust controls and safeties.
 - 3. Fans and components will be considered defective if they do not pass tests and inspections.
 - 4. Prepare test and inspection reports.

END OF SECTION 233423

SECTION 233713.13 - AIR DIFFUSERS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Round ceiling diffusers.
 - 2. Rectangular and square ceiling diffusers.
- B. Related Requirements:
 - 1. Section 23 33 00 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.
 - 2. Section 23 37 13.23 "Air Registers and Grilles" for adjustable-bar register and grilles, fixed-face registers and grilles, and linear bar grilles.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS**2.1 ROUND CEILING DIFFUSERS**

- A. Devices shall be specifically designed for variable-air-volume flows.
- B. Material: Steel.
- C. Finish: Baked enamel, white.

- D. Face Style: Three cone.
- E. Mounting: Duct connection.
- F. Pattern: As indicated on Drawings.
- G. Dampers: Radial opposed blade.
- H. Accessories:
 - 1. Equalizing grid.
 - 2. Plaster ring.
 - 3. Safety chain.

2.2 RECTANGULAR AND SQUARE CEILING DIFFUSERS

- A. Devices shall be specifically designed for variable-air-volume flows.
- B. Material: Steel.
- C. Finish: Baked enamel, white.
- D. Face Size: As indicted on Drawings.
- E. Face Style: As indicated on Drawings.
- F. Mounting: As indicated on Drawings.
- G. Pattern: Adjustable.
- H. Dampers: Radial opposed blade.
- I. Accessories:
 - 1. Equalizing grid.
 - 2. Plaster ring.
 - 3. Safety chain.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify District Construction Manager for a determination of final location.
- C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13.13

SECTION 233713.23 - AIR REGISTERS AND GRILLES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fixed face grilles.
- B. Related Requirements:
 - 1. Section 23 33 00 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to registers and grilles.
 - 2. Section 23 37 13.13 "Air Diffusers" for various types of air diffusers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Register and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Ceiling suspension assembly members.
 - 2. Method of attaching hangers to building structure.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 5. Duct access panels.
- B. Source quality-control reports.

PART 2 - PRODUCTS**2.1 GRILLES****A. Return Grille:**

1. Material: Steel.
2. Finish: Baked enamel, white.
3. Face Arrangement: Perforated core.
4. Core Construction: Integral.
5. Frame: 1 inch wide.
6. Mounting: Countersunk screw or Lay-in.

2.2 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate registers and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine areas where registers and grilles are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install registers and grilles level and plumb.
- B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify District Construction Manager for a determination of final location.
- C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13.23

SECTION 260010 - SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL**PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section specifies supplemental requirements generally applicable to the Work specified in Division 26. This Section is also referenced by related Work specified in other Divisions.

1.2 REFERENCES

- A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:

1. 8P8C: An 8-position 8-contact modular jack.
2. A: Ampere, unit of electrical current.
3. AC or ac: Alternating current.
4. AIC: Ampere interrupting capacity.
5. AL, Al, or ALUM: Aluminum.
6. AWG: American wire gauge; see ASTM B258.
7. BAS: Building automation system.
8. BIM: Building information modeling.
9. CAD: Computer-aided design or drafting.
10. CATV: Community antenna television.
11. CB: Circuit breaker.
12. cd: Candela, the SI fundamental unit of luminous intensity.
13. CO/ALR: Copper-aluminum, revised.
14. CU or Cu: Copper.
15. CU-AL or AL-CU: Copper-aluminum.
16. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.
17. dB(A-weighted) or dB(A): Decibel acoustical sound pressure level with A-weighting applied in accordance with IEC 61672-1.
18. dB(adjusted) or dBa: Decibel weighted absolute noise power with respect to 3.16 pW (minus 85 dBm).
19. dBm: Decibel absolute power with respect to 1 mW.
20. DC or dc: Direct current.
21. DDC: Direct digital control (HVAC).
22. EG: Equipment grounding conductor.
23. EMF: Electromotive force.
24. EMI: Electromagnetic interference.
25. fc: Footcandle, an internationally recognized unit of illuminance equal to one lumen per square foot or 10.76 lx. The simplified conversion 1 fc = 10 lx in the Specifications is common practice and considered adequate precision for building construction activities. When there are conflicts, lux is the primary unit; footcandle is specified for convenience.
26. FLC: Full-load current.

- 27. ft: Foot.
- 28. GEC: Grounding electrode conductor.
- 29. GFCI: Ground-fault circuit interrupter.
- 30. GFP: Ground-fault protection of equipment.
- 31. GND: Ground.
- 32. HACR: Heating, air conditioning, and refrigeration.
- 33. HP or hp: Horsepower.
- 34. HVAC: Heating, ventilating, and air conditioning.
- 35. Hz: Hertz.
- 36. IBT: Intersystem bonding termination.
- 37. inch: Inch. To avoid confusion, the abbreviation "in." is not used.
- 38. IP: Ingress protection rating (enclosures); Internet protocol (communications).
- 39. IR: Infrared.
- 40. IT&R: Inspecting, testing, and repair.
- 41. ITE: Information technology equipment.
- 42. kAIC: Kiloampere interrupting capacity.
- 43. kcmil or MCM: One thousand circular mils.
- 44. kV: Kilovolt.
- 45. kVA: Kilovolt-ampere.
- 46. kW: Kilowatt.
- 47. kWh: Kilowatt-hour.
- 48. LAN: Local area network.
- 49. lb: Pound (weight).
- 50. lbf: Pound (force).
- 51. LCD: Liquid-crystal display.
- 52. LED: Light-emitting diode.
- 53. lm: Lumen, the SI derived unit of luminous flux.
- 54. LRC: Locked-rotor current.
- 55. LV: Low voltage.
- 56. lx: Lux, the SI derived unit of illuminance equal to one lumen per square meter.
- 57. MLO: Main lugs only.
- 58. NC: Normally closed.
- 59. Ni-Cd: Nickel-cadmium.
- 60. Ni-MH: Nickel-metal hydride.
- 61. NO: Normally open.
- 62. NPT: National (American) standard pipe taper.
- 63. OCPD: Overcurrent protective device.
- 64. PC: Personal computer.
- 65. PF or pf: Power factor.
- 66. PLFA: Power-limited fire alarm.
- 67. PoE: Power over Ethernet.
- 68. PVC: Polyvinyl chloride.
- 69. RFI: (electrical) Radio-frequency interference; (contract) Request for interpretation.
- 70. RMS or rms: Root-mean-square.
- 71. RPM or rpm: Revolutions per minute.
- 72. SPD: Surge protective device.
- 73. sq.: Square.
- 74. SWD: Switching duty.
- 75. TCP/IP: Transmission control protocol/Internet protocol.

SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL**26 00 10 - 2****DEHESA SCHOOL MODERNIZATION**

- 76. TR: Tamper resistant.
- 77. TVSS: Transient voltage surge suppressor.
- 78. UL: (standards) Underwriters Laboratories, Inc.; (product categories) UL, LLC.
- 79. UL CCN: UL Category Control Number.
- 80. UPS: Uninterruptible power supply.
- 81. USB: Universal serial bus.
- 82. UV: Ultraviolet.
- 83. V: Volt, unit of electromotive force.
- 84. V(ac): Volt, alternating current.
- 85. V(dc): Volt, direct current.
- 86. VA: Volt-ampere, unit of complex electrical power.
- 87. VPN: Virtual private network.
- 88. W: Watt, unit of real electrical power.
- 89. Wh: Watt-hour, unit of electrical energy usage.
- 90. WR: Weather resistant.

B. Abbreviations and Acronyms for Electrical Raceway Types:

- 1. EMT: Electrical metallic tubing.
- 2. FMC: Flexible metal conduit.
- 3. IMC: Steel electrical intermediate metal conduit.
- 4. LFMC: Liquidtight flexible metal conduit.
- 5. OFR: Optical fiber raceway.
- 6. OFR-GP: General-purpose optical fiber raceway.
- 7. OFR-P: Plenum optical fiber raceway.
- 8. OFR-R: Riser optical fiber raceway.
- 9. PVC: Rigid PVC conduit.
- 10. PVC-40: Schedule 40 rigid PVC conduit.
- 11. PVC-80: Schedule 80 rigid PVC Conduit.
- 12. RGS: Galvanized-steel electrical rigid metal conduit.

C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:

- 1. CL2: Class 2 cable.
- 2. CL2P: Class 2 plenum cable.
- 3. CL2R: Class 2 riser cable.
- 4. CL2X: Class 2 cable, limited use.
- 5. CL3: Class 3 cable.
- 6. CL3P: Class 3 plenum cable.
- 7. CL3R: Class 3 riser cable.
- 8. CL3X: Class 3 cable, limited use.
- 9. CM: Communications general-purpose cable.
- 10. CMG: Communications general-purpose cable.
- 11. CMP: Communications plenum cable.
- 12. CMR: Communications riser cable.
- 13. CMUC: Under-carpet communications wire and cable.
- 14. CMX: Communications cable, limited use.
- 15. FPL: Power-limited fire-alarm cable.
- 16. FPLP: Power-limited fire-alarm plenum cable.
- 17. FPLR: Power-limited fire-alarm riser cable.

SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL

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DEHESA SCHOOL MODERNIZATION

18. OFC: Conductive optical fiber general-purpose cable.
19. OFN: Nonconductive optical fiber general-purpose cable.
20. OFNP: Nonconductive optical fiber plenum cable.
21. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
22. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.
23. XHHW: Cross-linked polyethylene, heat- and moisture-resistant cable.

D. Definitions:

1. 8-Position 8-Contact (8P8C) Modular Jack: An unkeyed jack with up to eight contacts commonly used to terminate twisted-pair and multiconductor Ethernet cable. Also called a "TIA-1096 miniature 8-position series jack" (8PSJ), or an "IEC 8877 8-pole jack."
 - a. Be careful when suppliers use "RJ45" generically. Obsolete RJ45 jacks used for analog telephone cables have rejection keys. 8P8C jacks used for digital telephone cables and Ethernet cables do not have rejection keys.
2. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
3. Communications Jack: A fixed connecting device designed for insertion of a communications cable plug.
4. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
5. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.
6. Designated Seismic System: A system component that requires design in accordance with Ch. 13 of ASCE/SEI 7 and for which the Component Importance Factor is greater than 1.0.
7. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
 - a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
 - b. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
 - c. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.

- d. Device Box: A box with provisions for mounting a wiring device directly to the box.
 - e. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
 - f. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
 - g. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
 - h. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
 - i. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
 - j. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
 - k. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.
8. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction that are designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety to human life.
9. Fault Limited: Providing or being served by a source of electrical power that is limited to not more than 100 W when tested in accordance with UL 62368-1.
- a. The term "fault limited" is intended to encompass most Class 1, 2, and 3 power-limited sources complying with Article 725 of CEC; Class ES1 and ES2 electrical energy sources that are Class PS1 electrical power sources (e.g., USB); and Class ES3 electrical energy sources that are Class PS1 and PS2 electrical power sources (e.g., PoE). See UL 62368-1 for discussion of classes of electrical energy sources and classes of electrical power sources.
10. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.
11. Jacket: A continuous nonmetallic outer covering for conductors or cables.
12. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
13. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
14. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.

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15. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
16. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
17. Sheath: A continuous metallic covering for conductors or cables.
18. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
19. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
 - a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
 - b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
 - c. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
20. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.

1.3 COORDINATION

- A. Arrange to provide temporary electrical power in accordance with requirements specified in Division 01.

1.4 PREINSTALLATION MEETINGS

- A. Electrical Preconstruction Conference: Schedule conference with Architect and Owner, not later than 10 days after notice to proceed. Agenda topics include, but are not limited to, the following:
 1. Electrical installation schedule.
 2. Status of power system studies.
 3. Value analysis proposals and requests for substitution of electrical equipment.
 4. Commissioning activities.

1.5 SEQUENCING

- A. Conduct and submit results of power system studies before submitting Product Data and Shop Drawings for electrical equipment.

1.6 INFORMATIONAL SUBMITTALS

- A. Electrical installation schedule.
- B. Qualification statements.
- C. Seismic-load performance certificates.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
- B. Software and firmware operational documentation.
- C. Software.

1.8 QUALITY ASSURANCE

- A. Qualifications: Prepare and submit qualification statements for the following entities performing Work on Project:
 - 1. Qualified Regional Manufacturer: Manufacturer, possessing qualifications specified in Section 014000 "Quality Requirements," that maintains a service center capable of providing training, parts, and emergency on-site repairs to Project site with response time less than 24 hours.
 - 2. Structural Professional Engineer: Professional engineer possessing active qualifications specified in Section 014000 "Quality Requirements," with expertise in structural engineering, including seismic- modeling and analysis.
 - 3. Electrical Professional Engineer: Professional engineer possessing active qualifications specified in Section 014000 "Quality Requirements," with expertise in electrical engineering, including electrical power system modeling and analysis of electrical safety in accordance with NFPA 70E.
 - 4. Power Quality Specialist: Recognized experts possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction, and able to present unexpired NICET Level 4 credentials with documented experience in power quality testing for installations similar in complexity to this Project.
 - 5. Low-Voltage Electrical Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.

- a. On-site electrical testing supervisors must have documented certification and experience with testing electrical equipment in accordance with NETA testing standards.
6. Power-Limited Electrical Testing Agency: Entity possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.
 - a. On-site power-limited testing supervisor must have BICSI Registered Communications Distribution Designer certification and documented training and experience with testing power-limited equipment in accordance with NETA testing standards.
7. Structural Testing and Inspecting Agency: Entity possessing active qualifications specified in Section 014000 "Quality Requirements" with documented training and experience with testing structural concrete, and seismic controls.
8. Luminaire Photometric Testing Laboratory: Entity possessing active qualifications specified in Section 014000 "Quality Requirements" accredited under the NVLAP for Energy Efficient Lighting Products, and complying with applicable IES testing standards.
9. Lighting Testing and Inspecting Agency: Entity possessing active qualifications specified in Section 014000 "Quality Requirements" with documented training and experience with testing and inspecting lighting installations in accordance with IES LM-5.

B. Certifications:

1. Seismic-Load Performance Certificates: Provide special certification for designated seismic systems as indicated in Paragraph 13.2.2 "Special Certification Requirements for Designated Seismic Systems" of ASCE/SEI 7-16 for all designated seismic-load systems identified on Drawings or in the Specifications.
 - a. Include the following information:
 - 1) Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2) Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3) Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - 4) Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
 - 5) Provide equipment manufacturer's written certification for each designated active electrical seismic device and system, stating that it will remain operable following the design earthquake. Certification must be based on requirements of ASCE/SEI 7, including shake table testing per ICC-ES AC156 or a similar nationally recognized testing standard procedure acceptable to authorities having jurisdiction.
 - 6) Submit evidence demonstrating compliance with these requirements for approval to authorities having jurisdiction after review and acceptance by qualified structural professional engineer.

- b. The following systems and components are Designated Seismic Systems and require written special certification of seismic qualification by manufacturer:
 - 1) Hangers and supports specified in Section 260529 "Hangers and Supports for Electrical Systems."
 - 2) Seismic restraints specified in Section 260548.16 "Seismic Controls for Electrical Systems."

PART 2 - PRODUCTS

2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT

- A. Substitution requests for electrical equipment will be entertained under the following conditions:
 - 1. Notification of Contractor's intent to request substitutions for convenience must be declared during the Electrical Preconstruction Conference so potential risks to system performance and construction schedule may be identified for Contractor's response in submission of the substitution request. Submission of requests for substitutions for convenience must meet the conditions and deadline specified in Section 012500 "Substitution Procedures" to receive approval.
 - 2. For electrical equipment and systems, substitutions for cause are considered major construction risks. If it is possible that Contractor may need to request substitutions for cause because of equipment unavailability, or inability to meet construction schedule because of lead time, Contractor must declare the possibility during the Electrical Preconstruction Conference to permit establishing a mitigation plan for minimizing risks to system performance and construction schedule.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to Owner and Architect including, but not limited to, milestone dates for the following activities:
 - 1. Submission of power system studies.
 - 2. Submission of specified coordination drawings.
 - 3. Submission of action submittals specified in Division 26.
 - 4. Orders placed for major electrical equipment.
 - 5. Arrival of major electrical equipment on-site.
 - 6. Preinstallation meetings specified in Division 26.
 - 7. Closing of walls and ceilings containing electrical Work.
 - 8. System startup, testing, and commissioning activities for major electrical equipment.
 - 9. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, etc.).

10. Requests for special inspections.
 11. Requests for inspections by authorities having jurisdiction.
- B. Coordination Drawings for Structural Supports: Show coordination of structural supports for equipment and devices, including restraints and bracing for control of seismic and wind loads, with other systems, equipment, and structural supports in the vicinity.
- C. Coordination Drawings for Ceiling Areas: Where indicated on Drawings, provide reflected ceiling plan(s), supplemented by sections and other details, drawn to scale, in accordance with Section 013100 "Project Management and Coordination," on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Suspended ceiling components.
 2. Structural members to which equipment, luminaires, and suspension systems will be attached.
 3. Partitions and millwork that penetrate ceiling or extend to within 12 inches of plane of luminaires.
 4. Size and location of access panels on ceilings.
 5. Elevation, size, and route of plumbing piping.
 6. Elevation, size, and route of ductwork.
 7. Elevation, size, and route of cable tray.
 8. Elevation, size, and route of conduit.
 9. Elevation and size of wall-mounted and ceiling-mounted equipment.
 10. Moldings.
 11. Access panels.
 12. Air inlets and outlets.
 13. Control modules.
 14. Luminaires.
 15. Communications devices.
 16. Speakers.
 17. Ceiling-mounted projectors.
 18. Security devices.
 19. Fire-alarm devices.
 20. Indicate clear dimensions for maintenance access in front of equipment.
 21. Indicate dimensions of fully open access doors.
- D. Coordination Drawings for Conduit Routing: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
1. Structural members in paths of conduit groups with common supports.
 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- E. Protection of In-Place Conditions:
1. Existing equipment and systems that are to remain, or which must remain operational until removed and replaced by the work of this project, shall be protected in place during construction.

3.2 INSTALLATION OF ELECTRICAL WORK

- A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with CEC and NECA NEIS 1 for installation of Work specified in Division 26. Consult Architect for resolution of conflicting requirements.

3.3 SYSTEM STARTUP

- A. Commissioning Activities:
 - 1. Refer to the requirements of Division 1 and District standards.

3.4 FIELD QUALITY CONTROL

- A. Adminstrant for Low-Voltage Electrical Tests and Inspections:
 - 1. Engage qualified low-voltage electrical testing and inspecting agency to administer and perform tests and inspections.
 - 2. Administer and perform tests and inspections and where specified for specific equipment, with assistance of factory-authorized service representative.
- B. Adminstrant for Power-Limited Electrical Tests and Inspections:
 - 1. Engage qualified power-limited electrical testing and inspecting agency to administer and perform tests and inspections.
 - 2. Administer and perform tests and inspections with assistance of factory-authorized service representative.
- C. Adminstrant for Field Tests and Inspections of Lighting Installations:
 - 1. Engage qualified lighting testing and inspecting agency to administer and perform tests and inspections.
 - 2. Administer and perform tests and inspections with assistance of factory-authorized service representative.

3.5 CLEANING

- A. Waste Management:
 - 1. Refer to the requirements of Division 1.

3.6 CLOSEOUT ACTIVITIES

- A. Operation and Maintenance Data: Prepare and submit the following:
 - 1. Provide emergency operation, normal operation, and preventive maintenance manuals for each system, equipment, and device.
 - 2. Include the following information:

- a. Manufacturer's operating specifications.
 - b. User's guides for software and hardware.
 - c. Schedule of maintenance material items recommended to be stored at Project site.
 - d. Detailed instructions covering operation under both normal and abnormal conditions.
 - e. Manufacturer's instructions for setting field-adjustable components.
 - f. Manufacturer's instructions for testing, adjusting, and reprogramming microprocessor controls.
 - g. Include copies of demonstration and training videos.
- B. Software and Firmware Operational Documentation: Provide software and firmware operational documentation, including the following:
 1. Software operating and upgrade manuals.
 2. Names, versions, and website addresses for locations of installed software.
 3. Device address list.
 4. Printout of software application and graphic screens.
 5. Testing and adjusting of panic and emergency power features.
 6. For lighting controls, include the following:
 - a. Adjustments of scene preset controls, adjustable fade rates, and fade overrides.
 - b. Operation of adjustable zone controls.
- C. Software:
 1. Program Software Backup: Provide username and password for approved online or cloud solution.
 2. Provide to Owner upgrades and unrestricted licenses for installed and backup software, including operating systems and programming tools required for operation and maintenance.
- D. Demonstration: Demonstrate to Owner's designated maintenance and clerical personnel how to operate the following systems and equipment:
 1. Lighting control devices specified in Section 260923 "Lighting Control Devices."
- E. Training: Train Owner's maintenance personnel on the following topics:
 1. Electrical power safety fundamentals refresher including arc-flash hazard safety features of electrical power distribution equipment in facility, interpreting arc-flash warning labels, selecting appropriate personal protective equipment, and understanding significance of findings documented in study report specified in Section 260573.19 "Arc-Flash Hazard Analysis."
 2. How to adjust, operate, and maintain devices specified in Section 260923 "Lighting Control Devices."

END OF SECTION 260010

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Copper building wire.
2. Fire-alarm wire and cable.
3. Connectors and splices.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.
3. Section 271513 "Communications Copper Horizontal Cabling" for twisted pair cabling used for data circuits.

1.2 ACTION SUBMITTALS**A. Product Data:**

1. Copper building wire.
2. Fire-alarm wire and cable.
3. Connectors and splices.

1.3 INFORMATIONAL SUBMITTALS**A. Field quality-control reports.****PART 2 - PRODUCTS****2.1 COPPER BUILDING WIRE****A. Manufacturers:** Subject to compliance with requirements, provide products by one of the following:

1. Cerro Wire LLC.
2. General Cable; Prysmian Group North America.

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3. Okonite Company (The).
 4. Southwire Company, LLC.
- B. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- C. Standards:
1. Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and use.
 2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- E. Conductor Insulation:
1. Type THHN and Type THWN-2. Comply with UL 83.
 2. Type XHHW-2. Comply with UL 44.
- 2.2 FIRE-ALARM WIRE AND CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Allied Wire & Cable Inc.
 2. CommScope, Inc.
 3. Superior Essex Inc.; subsidiary of LS Corp.
 4. West Penn Wire; brand of Belden, Inc.
- B. General Wire and Cable Requirements: NRTL listed and labeled as complying with CEC, Article 760.
- C. Signaling Line Circuits: Twisted, shielded pair, not less than size as recommended by system manufacturer.
- D. Non-Power-Limited Circuits: Solid-copper conductors with 600 V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.
1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
 2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.

2.3 CONNECTORS AND SPLICES

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

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1. 3M Electrical Products.
 2. AFC Cable Systems; Atkore International.
 3. ILSCO.
 4. Ideal Industries, Inc.
 5. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
- B. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and use.
- C. Jacketed Cable Connectors: For steel jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
1. Material: Copper or Bronze.
 2. Type: One hole with standard barrels.
 3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders:
1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits:
1. Copper:
 - a. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
- D. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.

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- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION, GENERAL

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points in accordance with Section 260533.13 "Conduits for Electrical Systems" prior to pulling conductors and cables.
- C. 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.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 INSTALLATION OF FIRE-ALARM WIRE AND CABLE

- A. Comply with NFPA 72.
- B. Wiring Method: Install wiring in metal pathway according to Section 270529 "Hangers and Supports for Communications Systems."
 - 1. Install plenum cable in environmental airspaces, including plenum ceilings.
 - 2. Fire-alarm circuits and equipment control wiring associated with fire-alarm system must be installed in a dedicated pathway system.
 - a. Cables and pathways used for fire-alarm circuits, and equipment control wiring associated with fire-alarm system, may not contain any other wire or cable.
 - 3. Signaling Line Circuits: Power-limited fire-alarm cables may be installed in the same cable or pathway as signaling line circuits.
- C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring

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diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

- D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes; cabinets; or equipment enclosures where circuit connections are made.
- E. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire-alarm system junction boxes and covers red.
- F. Risers: Install at least two vertical cable risers to serve the fire-alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent receipt or transmission of signals from other floors or zones.
- G. Wiring to Remote Alarm Transmitting Device: 1 inch conduit between the fire-alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.5 CONNECTIONS

- A. Tighten electrical 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-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inch of slack.
- D. Comply with requirements in Section 284621.11 "Addressable Fire-Alarm Systems" for connecting, terminating, and identifying wires and cables.

3.6 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.7 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.8 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.9 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
 - 2. Perform each of the following visual and electrical tests:
 - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
 - b. Test bolted connections for high resistance using one of the following:
 - 1) A low-resistance ohmmeter.
 - 2) Calibrated torque wrench.
 - 3) Thermographic survey.
 - c. Inspect compression-applied connectors for correct cable match and indentation.
 - d. Inspect for correct identification.
 - e. Inspect cable jacket and condition.
 - f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable for a one-minute duration.
 - g. Continuity test on each conductor and cable including each conductor of parallel sets.
 - h. Uniform resistance of parallel conductors.
 - 3. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
 - a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

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- b. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- 4. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.
- B. Cables will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports to record the following:
 - 1. Procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Backboards.
2. Category 5e balanced twisted pair cable.
3. Category 6 balanced twisted pair cable.
4. Balanced twisted pair cable hardware.
5. RS-232 cable.
6. RS-485 cable.
7. Control-circuit conductors.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS**A. Product Data:**

1. Backboards.
2. Category 5e balanced twisted pair cable.
3. Category 6 balanced twisted pair cable.
4. Balanced twisted pair cable hardware.
5. RS-232 cable.
6. RS-485 cable.
7. Control-circuit conductors.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- B. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.

1. Flame Travel Distance: 60 inch or less.
2. Peak Optical Smoke Density: 0.5 or less.
3. Average Optical Smoke Density: 0.15 or less.

- C. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.
- D. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

2.2 BACKBOARDS

- A. Description: Plywood, fire-retardant treated, 3/4 by 48 by 96 inch. Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."
- B. Painting: Paint plywood on all sides and edges with flat white latex paint. Do not paint over fire retardant data. Comply with requirements in Section 099123 "Interior Painting."

2.3 CATEGORY 5e BALANCED TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 5e cable at frequencies up to 100 MHz.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AMP NETCONNECT; a TE Connectivity Ltd. company.
 2. Belden Inc.
 3. CommScope, Inc.
 4. General Cable; Prysmian Group North America.
- C. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 5e cables.
- D. Conductors: 100 ohm, No. 24 AWG solid copper.
- E. Shielding/Screening: Unshielded twisted pairs (UTP).
- F. Cable Rating: Plenum.
- G. Jacket: Gray thermoplastic.

2.4 CATEGORY 6 BALANCED TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250 MHz.

- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AMP NETCONNECT; a TE Connectivity Ltd. company.
 - 2. Belden Inc.
 - 3. CommScope, Inc.
 - 4. General Cable; Prysmian Group North America.
- C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
- D. Conductors: 100 ohm, No. 23 AWG solid copper.
- E. Shielding/Screening: Unshielded twisted pairs (UTP).
- F. Cable Rating: Plenum.
- G. Jacket: Blue thermoplastic.

2.5 BALANCED TWISTED PAIR CABLE HARDWARE

- A. Description: Hardware designed to connect, splice, and terminate balanced twisted pair copper communications cable.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AMP NETCONNECT; a TE Connectivity Ltd. company.
 - 2. Belden Inc.
 - 3. CommScope, Inc.
 - 4. General Cable; Prysmian Group North America.
- C. General Requirements for Balanced Twisted Pair Cable Hardware:
 - 1. Comply with the performance requirements of Category 5e or Category 6.
 - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
 - 3. Cables must be terminated with connecting hardware of same category or higher.
- D. Source Limitations: Obtain balanced twisted pair cable hardware from same manufacturer as balanced twisted pair cable, from single source.
- E. Connecting Blocks: 110-style IDC for Category 5e 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.
- F. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
 - 1. Number of Terminals per Field: One for each conductor in assigned cables.

- G. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
1. Features:
 - a. Universal T568A and T568B wiring labels.
 - b. Labeling areas adjacent to conductors.
 - c. Replaceable connectors.
 - d. 24 or 48 ports.
 2. Construction: 16-gauge steel and mountable on 19 inch equipment racks.
 3. Number of Jacks per Field: One for each four-pair cable indicated.
- H. Patch Cords: Factory-made, four-pair cables in 36 inch lengths; terminated with an eight-position modular plug at each end.
1. Patch cords must have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords must have latch guards to protect against snagging.
 2. Patch cords must have color-coded boots for circuit identification.
- I. Plugs and Plug Assemblies:
1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair 100 ohm unshielded or shielded balanced twisted pair cable.
 2. Comply with IEC 60603-7-1, IEC 60603-7-2, IEC 60603-7-3, IEC 60603-7-4, and IEC 60603-7.5.
 3. Marked to indicate transmission performance.
- J. Jacks and Jack Assemblies:
1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair 100 ohm unshielded or shielded balanced twisted pair cable.
 2. Designed to snap-in to a patch panel or faceplate.
 3. Standards:
 - a. Category 5e, unshielded balanced twisted pair cable must comply with IEC 60603-7-2.
 - b. Category 6, unshielded balanced twisted pair cable must comply with IEC 60603-7-4.
 4. Marked to indicate transmission performance.
- K. Faceplate:
1. Two port, vertical single-gang faceplates designed to mount to single-gang wall boxes.
 2. Plastic Faceplate: High-impact plastic. Coordinate color with Section 260533.16 "Boxes and Covers for Electrical Systems."

3. For use with snap-in jacks accommodating any combination of balanced twisted pair, optical fiber, and coaxial work area cords.
 - a. Flush mounting jacks, positioning the cord at a 45-degree angle.

L. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.6 RS-232 CABLE

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

1. AMP NETCONNECT; a TE Connectivity Ltd. company.
2. Belden Inc.
3. CommScope, Inc.
4. General Cable; Prysmian Group North America.

B. PVC-Jacketed, TIA 232-F:

1. Three, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Polypropylene insulation.
3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
4. PVC jacket.
5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. CEC Type: Type CM.
7. Flame Resistance: Comply with UL 1581.

C. Plenum-Type, TIA 232-F:

1. Three, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PE insulation.
3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
4. Fluorinated ethylene propylene jacket.
5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.7 RS-485 CABLE

A. Standard Cable: CEC, Type CMG.

1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.

4. PVC jacket.
5. Flame Resistance: Comply with UL 1685.

B. Plenum-Rated Cable: CEC, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262.

2.8 CONTROL-CIRCUIT CONDUCTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cerro Wire LLC.
 2. General Cable; Prysmian Group North America.
 3. Okonite Company (The).
 4. Southwire Company, LLC.
- B. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
- C. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
- D. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test twisted pair cables according to TIA-568-C.2.
- C. Cable will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Test cables on receipt at Project site.
1. Test each pair of twisted pair cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 260533.13 "Conduits for Electrical Systems" for raceway selection and installation requirements for conduits as supplemented or modified in this Section.
- B. Comply with requirements in Section 260533.23 "Surface Raceways for Electrical Systems" for raceway selection and installation requirements for wireways as supplemented or modified in this Section.
- C. Comply with requirements in Section 260533.16 "Boxes and Covers for Electrical Systems" for raceway selection and installation requirements for boxes as supplemented or modified in this Section.
 - 1. Outlet boxes for cables must be no smaller than 4 inch square by 2-1/8 inch deep with extension ring sized to bring edge of ring to within 1/8 inch of the finished wall surface.
 - 2. Flexible metal conduit must not be used.
- D. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.
- E. Install manufactured conduit sweeps and long-radius elbows if possible.
- F. Raceway Installation in Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
 - 2. Install cable trays to route cables if conduits cannot be located in these positions.
 - 3. Secure conduits to backboard if entering the room from overhead.
 - 4. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- G. Backboards: Install backboards with 96 inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA-568-C Series of standards.
 - 2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
 - 3. Terminate all conductors; cable must not contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 - 4. Cables may not be spliced and must be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
 - 5. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.

6. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
 8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
 9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
 10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
 11. Support: Do not allow cables to lie on removable ceiling tiles.
 12. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
 13. Provide strain relief.
 14. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
 15. Ground wire must be copper, and grounding methods must comply with IEEE C2. Demonstrate ground resistance.
- C. Balanced Twisted Pair Cable Installation:
1. Comply with TIA-568-C.2.
 2. Install termination hardware as specified in Section 271513 "Communications Copper Horizontal Cabling" unless otherwise indicated.
 3. Do not untwist balanced twisted pair cables more than 1/2 inch at the point of termination to maintain cable geometry.
- D. Installation of Control-Circuit Conductors:
1. Install wiring in raceways.
 2. Use insulated spade lugs for wire and cable connection to screw terminals.
- E. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 2. Cable must not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.
- F. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA-569-D recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment must be as follows:

- a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 5 inch.
 - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 12 inch.
 - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 24 inch.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment must be as follows:
- a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 2-1/2 inch.
 - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 6 inch.
 - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inch.
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures must be as follows:
- a. Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inch.
 - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inch.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inch.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inch.

3.4 REMOVAL OF CONDUCTORS AND CABLES

- A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified with a tag for future use.

3.5 CONTROL-CIRCUIT CONDUCTORS

- A. Minimum Conductor Sizes:
1. Class 1 remote-control and signal circuits; No 14 AWG.
 2. Class 2 low-energy, remote-control, and signal circuits; No. 18 AWG.
 3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.6 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.7 GROUNDING

- A. For data communication wiring, comply with Section 270526 "Grounding and Bonding for Communications Systems."
- B. For control-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and Section 270553 "Identification for Communications Systems".
- B. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire must have a unique tag.

3.9 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Test cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination, but not after cross-connection.
 - a. Test instruments must meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in its "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in its "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 260523

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Grounding and bonding conductors.
2. Grounding and bonding clamps.
3. Grounding and bonding bushings.
4. Grounding and bonding hubs.
5. Grounding and bonding connectors.
6. Grounding and bonding busbars.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 270528 "Pathways for Communications Systems" specifies additional requirements for grounding and bonding of communications raceways, boxes, and cable trays.
3. Section 271100 "Communications Equipment Room Fittings" specifies additional requirements for grounding and bonding of communications equipment.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of product.**1.3 CLOSEOUT SUBMITTALS****A. Operation and Maintenance Data:**

1. In addition to items specified in Section 260010 "Supplemental Requirements for Electrical," include the following:
 - a. Plans showing locations of grounding features described in "Field Quality Control for Grounding and Bonding of Electrical Power" Article, including the following:
 - 1) Grounding electrode access enclosures.
 - 2) Grounding electrodes.
 - 3) Grounding arrangements and connections for separately derived systems.

PART 2 - PRODUCTS**2.1 GROUNDING AND BONDING CONDUCTORS****A. Equipment Grounding Conductor:**

1. General Characteristics: 600 V, THHN/THWN-2, copper wire or cable, green color, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. ASTM - Bare Copper Grounding and Bonding Conductor:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ERICO; brand of nVent Electrical plc.
 - b. Harger Lightning & Grounding; business of Harger, Inc.
 - c. Or equal.
2. Referenced Standards: Complying with one or more of the following:
 - a. Soft or Annealed Copper Wire: ASTM B3.
 - b. Concentric-Lay Stranded Copper Conductor: ASTM B8.
 - c. Tin-Coated Soft or Annealed Copper Wire: ASTM B33.
 - d. 19-Wire Combination Unilay-Stranded Copper Conductor: ASTM B787/B787M.

2.2 GROUNDING AND BONDING CLAMPS**A. Description:** Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications.**B. Source Limitations:** Obtain products from single manufacturer.**C. Performance Criteria:**

1. Regulatory Requirements:
 - a. Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
 - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

D. UL KDER and KDSH - Hex-Fitting-Type Pipe and Rod Grounding and Bonding Clamp:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper B-line; brand of Eaton, Electrical Sector.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. ERICO; brand of nVent Electrical plc.
 - d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - e. Or equal.
 2. General Characteristics:
 - a. Two pieces with stainless steel bolts.
 - b. Clamp Material: Silicon bronze.
 - c. Listed for outdoor use.
- E. UL KDER and KDSH - U-Bolt-Type Pipe and Rod Grounding and Bonding Clamp:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper B-line; brand of Eaton, Electrical Sector.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. ERICO; brand of nVent Electrical plc.
 - d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - e. Or equal.
 2. General Characteristics:
 - a. Clamp Material: Brass.
 - b. Listed for outdoor use.
- F. UL KDER - Beam Grounding and Bonding Clamp:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Anderson; brand of Hubbell Utility Solutions; Hubbell Incorporated.
 - c. Panduit Corp.
 - d. Or equal.
 2. General Characteristics: Mechanical-type, terminal, ground wire access from four directions; with dual, tin-plated or silicon bronze bolts.
- G. UL KDER - Exothermically Welded Connection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. ERICO; brand of nVent Electrical plc.

- d. Or equal.
- 2. General Characteristics: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING AND BONDING BUSHINGS

- A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.
- B. Source Limitations: Obtain products from single manufacturer.
- C. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- D. UL KDER - Bonding Bushing:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - b. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - d. Or equal.
 - 2. General Characteristics: Threaded bushing with insulated throat.
- E. UL KDER - Grounding Bushing:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - b. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - d. Or equal.
 - 2. General Characteristics: Threaded bushing with insulated throat and mechanical-type wire terminal.

2.4 GROUNDING AND BONDING HUBS

- A. Description: Hubs with certified grounding or bonding locknut.
- B. Source Limitations: Obtain products from single manufacturer.
- C. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- D. UL KDER - Grounding and Bonding Hub:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - d. Or equal.
 - 2. General Characteristics: Insulated, gasketed, watertight hub with mechanical-type wire terminal.

2.5 GROUNDING AND BONDING CONNECTORS

- A. Source Limitations: Obtain products from single manufacturer.
- B. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
 - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
- C. UL KDER - Lay-In Lug Mechanical-Type Grounding and Bonding Busbar Terminal:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Chatsworth Products, Inc.
 - c. Greaves Corp.; Essex Products Group, Inc.
 - d. ILSCO.
 - e. Or equal.
2. General Characteristics: Mechanical-type, copper rated for direct burial terminal with set screw.

2.6 INTERSYSTEM BONDING BRIDGE GROUNDING CONNECTORS

- A. Description: Devices that provide means for connecting communications systems grounding and bonding conductors at service equipment or at disconnecting means for buildings or structures.
- B. Performance Criteria:
 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 2. Listing Criteria:
 - a. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

2.7 GROUNDING AND BONDING BUSBARS

- A. Description: Miscellaneous grounding and bonding devices that serve as common connection for multiple grounding and bonding conductors.
- B. Source Limitations: Obtain products from single manufacturer.
- C. Performance Criteria:
 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

D. UL KDER - Equipment Room Grounding and Bonding Busbar:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Chatsworth Products, Inc.
 - b. Cooper B-line; brand of Eaton, Electrical Sector.
 - c. ERICO; brand of nVent Electrical plc.
 - d. ILSCO.
 - e. Or equal.
2. General Characteristics:
 - a. Bus: Rectangular bar of annealed copper.
 - b. Mounting Stand-Off Insulators: Lexan or PVC.
 - 1) Comply with UL 891 for use in 600 V switchboards, impulse tested at 5000 V.
3. Options:
 - a. Dimensions: 1/4 by 4 inch in cross section; length as indicated on Drawings.
 - b. Predrilled Hole Pattern: Complying with BICSI N3 and TIA-607 9/32 inch holes spaced 1-1/8 inch apart.
 - c. Mounting Hardware: Stand-off brackets that provide 2 inch clearance to access rear of bus. Brackets and bolts must be stainless steel.

E. UL KDER - Rack and Cabinet Bonding Busbar:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Chatsworth Products, Inc.
 - b. Cooper B-line; brand of Eaton, Electrical Sector.
 - c. Hoffman; brand of nVent Electrical plc.
 - d. Panduit Corp.
 - e. Or equal.
2. General Characteristics:
 - a. Bus: Rectangular bar of hard-drawn solid copper.
 - b. Horizontal Mounting Dimensions: Designed for mounting in [19 inch] [23 inch] wide equipment racks or cabinets.
 - c. Vertical Mounting Dimensions: Designed for mounting in [72 inch] [36 inch] high equipment racks or cabinets.
 - d. Predrilled Hole Pattern: Accepts connectors for grounding and bonding conductor sizes 14 AWG to 2/0 AWG.
 - e. Mounting Hardware: Stainless steel or copper-plated, for attachment to rack.

2.8 GROUNDING (EARTHING) ELECTRODES

- A. Source Limitations: Obtain products from single manufacturer.

B. Performance Criteria:**1. Regulatory Requirements:**

- a. Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

- a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

C. UL KDER - Rod Electrode:**1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:**

- a. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated.
- b. ERICO; brand of nVent Electrical plc.
- c. Galvan Industries, Inc.; Electrical Products Division, LLC.
- d. Harger Lightning & Grounding; business of Harger, Inc.
- e. Or equal.

2. General Characteristics: Copper-clad steel; 3/4 inch by 10 ft.**D. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to CEC; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.**

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
3. Concrete shall be in direct contact with the earth. Concrete installed with insulation, vapor barriers, films, or similar items separating the concrete from the earth is not considered to be in "direct contact" with the earth.

E. Concrete-Encased Grounding Electrode (Ufer Ground): Where suitable reinforced concrete foundations are available fabricate according to CEC; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length. Concrete shall be in direct contact with the earth. Concrete installed with insulation, vapor barriers, films, or similar items separating the concrete from the earth is not considered to be in "direct contact" with the earth.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. All grounding shall be in compliance with CEC Article 250.
- B. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.
- C. Inspect test results of grounding system measured at point of electrical service equipment connection.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS

- A. Grounding and Bonding Conductors:
 - 1. Provide solid conductor for 10 AWG and smaller, and stranded conductors for 8 AWG and larger unless otherwise indicated.
 - 2. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.
 - 3. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, 1/4 inch in diameter.
 - 4. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.
 - 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
 - 6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
- B. Grounding and Bonding Connectors:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.
- C. Grounding and Bonding Busbars: Provide in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated on Drawings.

3.3 SELECTION OF GROUNDING AND BONDING PRODUCTS FOR COMMUNICATIONS

- A. Comply with Section 270526 "Grounding and Bonding for Communications Systems", Section 270528 "Pathways for Communications Systems" and Section 271100 "Communications Equipment Room Fittings."

3.4 INSTALLATION OF GROUNDING AND BONDING

- A. Comply with manufacturer's published instructions.
- B. Special Techniques:
 - 1. Grounding and Bonding Conductors:
 - a. Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
 - 2. Grounding and Bonding Connectors: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
 - a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - b. Make connections with clean, bare metal at points of contact.
 - c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
 - d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 - e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
 - f. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1) Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate adjacent parts.
 - 2) Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3) Use exothermic-welded connectors for outdoor locations; if disconnect-type connection is required, use bolted clamp.
 - g. Grounding and Bonding for Piping:
 - 1) Metal Water Service Pipe: Install 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; use bolted clamp connector or bolt lug-type connector to pipe flange by using one of lug bolts of flange. Where dielectric main water fitting is installed, connect grounding conductor on

- street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- 2) Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with bolted connector.
 - 3) Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- h. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
 - i. Grounding for Steel Building Structure: Install driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 ft apart.
3. Grounding and Bonding Busbars:
- a. Install busbar horizontally, on insulated spacers 2 inch minimum from wall, 6 inch above finished floor unless otherwise indicated.
 - b. Where busbars are indicated on both sides of doorways, route bonding conductor up to top of door frame, across top of doorway, and down; connect to continuation of horizontal busbar.
4. Electrodes:
- a. Ground Rods: Drive rods until tops are 2 inch below finished floor or final grade unless otherwise indicated.
 - 1) Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2) Use exothermic welds for below-grade connections.
 - b. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least same distance from other grounding electrodes, and connect to service grounding electrode
5. Equipment Grounding and Bonding:
- a. Install insulated equipment grounding conductors with feeders and branch circuits.
 - b. Water Heater: Install separate insulated equipment grounding conductor to each electric water heater. Bond conductor to heater units, piping, connected equipment, and components.
 - c.

3.5 FIELD QUALITY CONTROL FOR GROUNDING AND BONDING

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

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1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench in accordance with manufacturer's published instructions.
3. Test completed grounding system at each location where maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method in accordance with IEEE Std 81.
 - c. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.
 - d. Perform grounding electrode tests by fall-of-potential method according to IEEE 81.
4. Test the resistance of all bonding jumpers using the 2-point method according to NETA recommendations.
5. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to record of tests and observations. Include 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.

C. Nonconforming Work:

1. Grounding system will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective components and retest.

D. Collect, assemble, and submit test and inspection reports.

1. Report measured ground resistances that exceed the following values:
 - a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 Ω .
 - b. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 Ω .

3.6 PROTECTION

- A.** After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Support, anchorage, and attachment components.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS**A. Product Data:**

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Slotted support systems, hardware, and accessories.
 - b. Clamps.
 - c. Hangers.
 - d. Sockets.
 - e. Eye nuts.
 - f. Fasteners.
 - g. Anchors.
 - h. Brackets.
2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.

C. Delegated Design Submittals: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.
2. Include design calculations for seismic restraints.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Engage a qualified structural professional engineer to design hanger and support system.
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame Rating: Class 1.
 - 2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper B-line; brand of Eaton, Electrical Sector.
 - b. G-Strut.
 - c. Unistrut; Atkore International.
 - 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 3. Material for Channel, Fittings, and Accessories: Galvanized steel.
 - 4. Channel Width: Selected for applicable load criteria.
 - 5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
- B. Conduit and Cable Support Devices: Steel or Stainless steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1) Hilti, Inc.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-line; brand of Eaton, Electrical Sector.
 - 2) Hilti, Inc.
 - 3) ITW Ramset/Red Head; Illinois Tool Works, Inc.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
6. Toggle Bolts: Stainless steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 SELECTION

- A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 1. NECA NEIS 101
 2. NECA NEIS 102.
 3. NECA NEIS 105.
 4. NECA NEIS 111.
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways specified in Section 260533.13 "Conduits for Electrical Systems."
- D. Comply with requirements for boxes specified in Section 260533.16 "Boxes and Covers for Electrical Systems."
- E. Provide seismic controls with hangers and supports in accordance with requirements specified in "Section 260548.16 "Seismic Controls for Electrical Systems."
- F. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERMC as required by CEC. Minimum rod size must be 1/4 inch in diameter.
- G. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding

specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- H. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2 inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 INSTALLATION OF SUPPORTS

- A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA NEIS 1, EMT IMC and ERMCM may be supported by openings through structure members, in accordance with CEC.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination must be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To Wood: Fasten with lag screws or through bolts.
 2. To New Concrete: Bolt to concrete inserts.
 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Expansion anchor fasteners.
 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inch thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inch thick.
 6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
 7. To Light Steel: Sheet metal screws.
 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 PAINTING

- A. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Type EMT raceways and elbows.
2. Type RGS raceways, elbows, couplings, and nipples.
3. Fittings for conduit, tubing, and cable.
4. Wireways and auxiliary gutters.
5. Metallic outlet boxes, device boxes, rings, and covers.
6. Cabinets, cutout boxes, junction boxes, pull boxes, and miscellaneous enclosures.
7. Cover plates for device boxes.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260519 "Low-Voltage for Electrical Power Conductors and Cables" for nonmetallic underground conduit with conductors (Type NUCC).
3. Section 270528 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.

1.2 ACTION SUBMITTALS**A. Product Data: For the following:**

1. EMT and RGS raceways and fittings
2. Wireways and auxiliary gutters.
3. Cabinets, cutout boxes, and miscellaneous enclosures.

PART 2 - PRODUCTS**2.1 TYPE EMT RACEWAYS AND ELBOWS****A. Performance Criteria:**

1. Regulatory Requirements: Listed and labeled in accordance with CEC and marked for intended location and use.
2. General Characteristics: UL 797 and UL Category Control Number FJMX.

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

1. Allied Tube & Conduit; a part of Atkore International.
2. Western Tube and Conduit Corporation.
3. Wheatland Tube Company.
4. Or Equal.

- C. Steel Electrical Metal Tubing (EMT) and Elbows:

1. Material: Steel.
2. Options:
 - a. Exterior Coating: Zinc.
 - b. Interior Coating: Zinc.
 - c. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.2 TYPE RGS RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

- A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with CEC and marked for intended location and use.
2. General Characteristics: UL 6 and UL Category Control Number DYIX.

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

1. Allied Tube & Conduit; a part of Atkore International.
2. Western Tube and Conduit Corporation.
3. Wheatland Tube Company.
4. Or Equal.

- C. Galvanized-Steel Electrical Rigid Metal Conduit (RGS), Elbows, Couplings, and Nipples:

1. Exterior Coating: Zinc.
2. Options:
 - a. Interior Coating: Zinc.
 - b. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.3 TYPE FMC RACEWAYS

- A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with CEC and marked for intended location and use.
2. General Characteristics: UL 1 and UL Category Control Number DXUZ.

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

1. Allied Tube & Conduit; a part of Atkore International.
2. Western Tube and Conduit Corporation.
3. Wheatland Tube Company.
4. Or Equal.

C. Steel Flexible Metal Conduit (FMC):

1. Material: Steel.
2. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.4 TYPE LFMC RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with CEC and marked for intended location and use.
2. General Characteristics: UL 360 and UL Category Control Number DXHR.

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

1. Allied Tube & Conduit; a part of Atkore International.
2. Western Tube and Conduit Corporation.
3. Wheatland Tube Company.
4. Or Equal.

C. Steel Liquidtight Flexible Metal Conduit (LFMC):

1. Material: Steel.
2. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.5 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with CEC and marked for intended location and use.

B. Fittings for Type RGS Raceways:

1. General Characteristics: UL 514B and UL Category Control Number DWTT.
2. Options:

- a. Material: Steel.
 - b. Coupling Method: Threaded.
 - c. Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
 - d. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.
- C. Fittings for Type EMT Raceways:
 - 1. General Characteristics: UL 514B and UL Category Control Number FKAV.
 - 2. Options:
 - a. Material: Steel.
 - b. Coupling Method: Compression coupling.
 - c. Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
 - d. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.
- D. Fittings for Type FMC Raceways:
 - 1. General Characteristics: UL 514B and UL Category Control Number ILNR.
- E. Fittings for Type LFMC Raceways:
 - 1. General Characteristics: UL 514B and UL Category Control Number DXAS.

2.6 WIREWAYS AND AUXILIARY GUTTERS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with CEC and marked for intended location and use.
 - 2. General Characteristics: UL 870 and UL Category Control Number ZOYX.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. B-line, an Eaton business.
 - 2. Hoffman; a brand of Pentair Equipment Protection.
 - 3. Square D.
 - 4. Or Equal.
- C. Metal Wireways and Auxiliary Gutters:
 - 1. Additional Characteristics:
 - a. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
 - b. Finish: Manufacturer's standard enamel finish.
 - 2. Options:
 - a. Degree of Protection: Type 1 unless otherwise indicated.

- b. Wireway Covers: Hinged type unless otherwise indicated.

2.7 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Performance Criteria:

- 1. Regulatory Requirements: Listed and labeled in accordance with CEC and marked for intended location and use.
- 2. General Characteristics: UL 514A and UL Category Control Number QCIT.

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

- 1. Hoffman; a brand of Pentair Equipment Protection.
- 2. Hubbell Incorporated.
- 3. RACO; Hubbell.
- 4. Or Equal.

C. Metallic Outlet Boxes:

- 1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
- 2. Options:
 - a. Material: Sheet steel.
 - b. Sheet Metal Depth: Minimum 2 inch.
 - c. Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb.

D. Metallic Conduit Bodies:

- 1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.

E. Metallic Device Boxes:

- 1. Description: Box with provisions for mounting wiring device directly to box.
- 2. Options:
 - a. Material: Sheet steel.
 - b. Sheet Metal Depth: minimum 2 inch.

F. Metallic Extension Rings:

- 1. Description: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both.

2.8 CABINETS, CUTOOT BOXES, JUNCTION BOXES, PULL BOXES, AND MISCELLANEOUS ENCLOSURES**A. Performance Criteria:**

1. Regulatory Requirements: Listed and labeled in accordance with CEC and marked for intended location and use.
2. General Characteristics:
 - a. Non-Environmental Characteristics: UL 50.
 - b. Environmental Characteristics: UL 50E.

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

1. Hoffman; a brand of Pentair Equipment Protection.
2. Hubbell Incorporated.
3. RACO; Hubbell.
4. Or Equal.

C. Sheet Metal Cabinets:

1. Description: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
2. Additional Characteristics: UL Category Control Number CYIV.
3. Options:
 - a. Degree of Protection: Type 1.

D. Indoor Sheet Metal Cutout Boxes:

1. Description: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.
2. Additional Characteristics: UL Category Control Number CYIV.
3. Options:
 - a. Degree of Protection: Type 1.

E. Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Additional Characteristics: UL Category Control Number BGUZ.
3. Options:
 - a. Degree of Protection: Type 1.

F. Indoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Additional Characteristics: UL Category Control Number BGUZ.

3. Options:
 - a. Degree of Protection: [Type 1].

G. Outdoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Additional Characteristics: UL Category Control Number BGUZ.
3. Options:
 - a. Degree of Protection: Type 3R.

2.9 COVER PLATES FOR DEVICES BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with CEC and marked for intended location and use.
2. General Characteristics:
 - a. Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.
 - b. Wallplate-Securing Screws: Metal with head color to match wallplate finish.

B. Nonmetallic Cover Plates for Device Boxes:

1. Manufacturer shall be the same as wiring device.
2. Options:
 - a. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
 - b. Wallplate Material: 0.060 inch thick high-impact thermoplastic (nylon) with smooth finish and color matching wiring device.

PART 3 - EXECUTION

3.1 SELECTION OF RACEWAYS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with CEC for selection of raceways. Consult Architect for resolution of conflicting requirements.
- B. Outdoors:
 1. Exposed and Subject to Severe Physical Damage: RGS.
 2. Exposed and Subject to Physical Damage: RGS.

- a. Locations less than 8 ft above finished floor.
 - 3. Exposed and Not Subject to Physical Damage: RGS.
 - C. Indoors:
 - 1. Exposed and Subject to Severe Physical Damage: RGS. Subject to severe physical damage includes the following locations:
 - a. Loading docks.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gymnasiums.
 - 2. Exposed and Subject to Physical Damage: RGS. Subject to physical damage includes the following locations:
 - a. Locations less than 2.5 m (8 ft) above finished floor.
 - b. Exposed stub-ups to above suspended ceilings.
 - 3. Exposed and Not Subject to Physical Damage: EMT.
 - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 5. Damp or Wet Locations: RGS.
 - D. Raceway Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
 - 1. RGS: Provide threaded type fittings unless otherwise indicated.
- 3.2 SELECTION OF BOXES AND ENCLOSURES
- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with CEC for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.
 - B. Degree of Protection:
 - 1. Outdoors:
 - a. Type 3R unless otherwise indicated.
 - b. Locations Exposed to Hosedown: Type 4.
 - 2. Indoors:
 - a. Type 1 unless otherwise indicated.
 - b. Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
 - c. Flush Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
 - d. Locations Exposed to Hosedown: Type 4.
 - C. Exposed Boxes Installed Less Than 8 ft Above Floor:

1. Provide cast-metal boxes.
2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.3 INSTALLATION OF RACEWAYS

A. Installation Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with CEC for installation of raceways. Consult Architect for resolution of conflicting requirements.
2. Comply with CEC limitations for types of raceways allowed in specific occupancies and number of floors.
3. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
4. Comply with NECA NEIS 101 for installation of steel raceways.
5. Install raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
6. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts..
7. Raceway Terminations at Locations Subject to Moisture or Vibration:
 - a. Provide insulating bushings to protect conductors, including conductors smaller than No. 4 AWG..

B. General Requirements for Installation of Raceways:

1. Complete raceway installation before starting conductor installation.
2. Install no more than equivalent of three 90-degree bends in conduit run except for communications and control wiring conduits, for which no more than equivalent of two 90-degree fewer bends are permitted. Support within 12 inch of changes in direction.
3. Make bends in raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with CEC minimum radii requirements. Provide only equipment specifically designed for material and size involved.
4. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
5. Support conduit within 12 inch of enclosures to which attached.
6. Install raceway sealing fittings at accessible locations in accordance with CEC and fill them with listed sealing compound. For concealed raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings in accordance with CEC.
7. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of raceways at the following points:
 - a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.

- b. Conduit extending from interior to exterior of building.
 - c. Where otherwise required by CEC.
 - 8. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
 - 9. Keep raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
 - 10. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
 - 11. Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- C. Requirements for Installation of Specific Raceway Types:
 - 1. Type RGS:
 - a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- D. Stub-ups to Above Recessed Ceilings:
 - 1. Provide EMT, or RGS for raceways.
 - 2. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- E. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.
 - 1. ERMCS-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 - 2. EMT: Provide compression, steel fittings. Comply with NEMA FB 2.10.
 - 3. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.
- F. Expansion-Joint Fittings:
 - 1. Install in runs of aboveground RGS and EMT conduit that are located where environmental temperature change may exceed 100 deg F and that have straight-run length that exceeds 100 ft.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at locations where conduits cross building or structure expansion joints.
5. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

G. Raceways Penetrating Rooms or Walls with Acoustical Requirements:

1. Seal raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.

3.4 INSTALLATION OF BOXES AND ENCLOSURES

- A. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
- B. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- C. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- D. Locate boxes so that cover or plate will not span different building finishes.
- E. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
- F. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
- G. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
- H. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.
- I. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
- J. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:
 1. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
 2. Provide gaskets for wallplates and covers.

3.5 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with

requirements in Section 078413 "Penetration Firestopping."

3.6 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

3.7 CLEANING

- A. Boxes: Remove construction dust and debris from device boxes, outlet boxes, and floor-mounted enclosures before installing wallplates, covers, and hoods.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Round sleeves.
2. Rectangular sleeves.
3. Grout.
4. Foam sealants.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of product.**PART 2 - PRODUCTS****2.1 ROUND SLEEVES****A. PE or PP Molded Sleeves:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Polywater Corporation.
 - b. Crete-Sleeve.
 - c. Or equal.
2. General Characteristics: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

B. Round, Galvanized-Steel, Sheet Metal Sleeves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the

following:

- a. Benefast.
- b. Specified Technologies Inc.
- c. Or equal.
2. General Characteristics: Galvanized-steel sheet; thickness not less than 0.0239 inch; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 RECTANGULAR SLEEVES

A. Rectangular, Galvanized-Steel, Sheet Metal Sleeves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Abesco Fire LLC.
 - b. Specified Technologies Inc.
 - c. Wiremold; Legrand North America, LLC.
 - d. Or equal.
2. General Characteristics:
 - a. Material: Galvanized sheet steel.
 - b. Minimum Metal Thickness:
 - 1) For sleeve cross-section rectangle perimeter less than 50 inch and with no side larger than 16 inches, thickness must be 0.052 inch.
 - 2) For sleeve cross-section rectangle perimeter not less than 50 inches or with one or more sides larger than 16 inch, thickness must be 0.138 inch.

2.3 GROUT

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Specified Technologies Inc.
 2. W. R. Meadows, Inc.
 3. Or equal.
- B. General Characteristics: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
 1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
 2. Design Mix: 5000 psi, 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

2.4 SILICONE SEALANTS**A. Performance Criteria:**

1. General Characteristics: Silicone, single component, neutral curing to produce a flexible, non-shrinking sealant. Sealant must not damage cables or crack penetrated structure.

PART 3 - EXECUTION**3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS****A. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:****1. Interior Penetrations of Non-Fire-Rated Walls and Floors:**

- a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 3. Size pipe sleeves to provide 1/4 inch annular clear space between sleeve and raceway or cable, unless sleeve-seal system is to be installed or seismic criteria require different clearance.
 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for wall assemblies.

C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.**D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves. Size sleeves to allow annular clear space between pipe and sleeve for installing seals.****3.2 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS**

- A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

SPECIFICATIONS**NO. XXXX-XXXX-XX**

- B. Install conduits and cable with no crossings within the sleeve.
- C. Fill opening around conduits and cables with silicone sealant without leaving voids.
- D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

END OF SECTION 260544

SECTION 260548.16 - SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Restraints - rigid type.
2. Restraints - cable type.
3. Restraint accessories.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.2 DEFINITIONS

- A. OSHPD:** Office of Statewide Health Planning and Development (for the State of California owned and regulated medical facilities).

1.3 COORDINATION**A. Tests and Inspections:**

1. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved) and provide notice at least seven days in advance.
2. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.

1.4 ACTION SUBMITTALS**A. Product Data:**

1. Restraints - rigid type.
2. Restraints - cable type.
3. Restraint accessories.

- B. Shop Drawings:** Show coordination of seismic bracing for components with other systems and equipment in the vicinity, including other supports and seismic restraints.

- C. Delegated Design Submittal for Each Seismic-Restraint Device: Signed and sealed by qualified structural professional engineer.
 - 1. For each seismic-restraint device, including restraint - rigid and cable type, restraint accessory, and concrete anchor and insert that is required by this Section or is indicated on Drawings, submit the following:
 - a. Seismic Restraints: Select seismic restraints complying with performance requirements, design criteria, and analysis data.
 - b. Post-Installed Concrete Anchors and Inserts: Include calculations showing anticipated seismic loads. Include certification that device is approved by qualified testing laboratory for seismic reinforcement use.
 - 2. Product Listing, Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).
- D. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified structural professional engineer to design seismic control system in accordance with criteria specified in Section 260010 "Supplemental Requirements for Electrical".
- B. Seismic- Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: an agency acceptable to authorities having jurisdiction.
- C. Consequential Damage: Provide additional seismic restraints for suspended components or anchorage of floor-, roof-, or wall-mounted components so that failure of a non-essential or essential component does not cause failure of any other essential building component.
- D. Fire/Smoke Resistance: Seismic- restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested and labeled by qualified testing laboratory in accordance with ASTM E84 or UL 723.
- E. Component Supports:
 - 1. Load ratings, features, and applications of all reinforcement components must be based on testing standards of qualified testing laboratory.

2.2 RESTRAINTS - RIGID TYPE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CADDY; brand of nVent Electrical plc.
 2. California Dynamics Corporation.
 3. Cooper B-line; brand of Eaton, Electrical Sector.
 4. Hilti, Inc.
 5. Unistrut; Atkore International.
- B. Description: Shop- or field-fabricated bracing assembly made of ANSI/AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINTS - CABLE TYPE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CADDY; brand of nVent Electrical plc.
 2. Cooper B-line; brand of Eaton, Electrical Sector.
 3. Gripple Inc.
 4. Loos & Co. Inc.
 5. VMC GROUP.
- B. Seismic- Restraint Cables: ASTM A492 stainless steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic-restraining cable service; with fittings attached by means of poured socket, swaged socket or mechanical (Flemish eye) loop.
- C. Restraint cable assembly and cable fittings must comply with ASCE/SEI 19. Cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.4 RESTRAINT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CADDY; brand of nVent Electrical plc.
 2. Cooper B-line; brand of Eaton, Electrical Sector.
 3. Hilti, Inc.
 4. Loos & Co. Inc.
 5. Mason Industries, Inc.
 6. Unistrut; Atkore International.

- B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Non-metallic stiffeners are unacceptable.
- C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.
- D. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 CONCRETE INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Hilti, Inc.
- B. Provide preset concrete inserts that are seismically prequalified in accordance with ICC-ES AC446 testing.
- C. Comply with MSS SP-58.

2.6 SOURCE QUALITY CONTROL

- A. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
 - 1. Include rated load capacity for each seismic- restraint device.
 - 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic- restraint component used.
 - 3. Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by an agency acceptable to authorities having jurisdiction.
 - 4. Annotate to indicate application of each product submitted and compliance with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive seismic control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry static, and seismic loads within specified loading limits.

3.3 INSTALLATION OF SEISMIC-RESTRAINT CONTROL DEVICES

- A. Provide seismic -restraint devices for systems and equipment where indicated in Equipment Schedules or Seismic Controls Schedule, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.
 - 1. Install equipment and devices to withstand the effects of earthquake motions.
- B. Installation of seismic restraints must not cause any stresses, misalignment, or change of position of equipment or conduits.
- C. Equipment Restraints:
 - 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- D. Raceway, Cable, Wireway, Cable Tray, and Busway Support and Hanger Restraints:
 - 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- E. Equipment and Hanger Restraints:
 - 1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- F. Install cables so they do not bend across edges of adjacent equipment or building structure.
- G. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

- A. Field tests must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:
 - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 2. Test no fewer than four of each type and size of installed anchors and fasteners selected by Architect.
 - 3. Test to 90 percent of rated proof load of device.
- C. Nonconforming Work:
 - 1. Seismic controls will be considered defective if they do not pass tests and inspections.
 - 2. Remove and replace malfunctioning units and retest as specified above.
- D. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

END OF SECTION 260548.16

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Labels.
2. Extruded insulating tubing.
3. Bands.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of product.**B. Samples:** For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.**C. Identification Schedule:** For each piece of electrical equipment and electrical system components to be index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.**PART 2 - PRODUCTS****2.1 LABELS****A. Performance Criteria:**

1. Regulatory Requirements: Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN PGDQ2 for components; including UL 969.

B. UL PGDQ2 - Self-Adhesive Wraparound Labels: Preprinted, 3 mil thick, polyester flexible

label with acrylic pressure-sensitive adhesive.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Brother International Corporation.
 - c. Grafoplast Wire Markers.
 - d. Ideal Industries, Inc.
 - e. Panduit Corp.
 2. Self-Lamination: Clear; UV-, weather-, and chemical-resistant; self-laminating, with protective shield over legend. Size labels such that clear shield overlaps entire printed legend.
 3. Marker for Labels:
 - a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - b. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- C. UL PGDQ2 - Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3 mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Brother International Corporation.
 - c. Grafoplast Wire Markers.
 - d. HellermannTyton.
 - e. Ideal Industries, Inc.
 - f. Panduit Corp.
 2. Minimum Nominal Size:
 - a. 1-1/2 by 6 inch for raceway and conductors.
 - b. 3-1/2 by 5 inch for equipment.
 - c. As required by authorities having jurisdiction.

2.2 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Carlton Industries, LP.
 2. HellermannTyton.
 3. Ideal Industries, Inc.
 4. Panduit Corp.

- C. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mil thick by 1 to 2 inch wide; compounded for outdoor use.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. Marking Services Inc.
 - d. emedco.

2.3 TAGS

- A. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory screened permanent designations; punched for use with self-locking cable tie fastener.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. Grafoplast Wire Markers.
 - d. LEM Products Inc.
 - e. Marking Services Inc.
 - f. Panduit Corp.
 - g. Seton Identification Products; a Brady Corporation company.

- B. Write-on Tags:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlton Industries, LP.
 - b. LEM Products Inc.
 - c. Seton Identification Products; a Brady Corporation company.
2. Polyester Tags: 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment.
3. Marker for Tags:
 - a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - b. Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.4 SIGNS

- A. Laminated Acrylic or Melamine Plastic Signs:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the

following:

- a. Brady Corporation.
- b. Carlton Industries, LP.
- c. Marking Services Inc.
- d. emedco.
2. Engraved legend.
3. Thickness:
 - a. For signs up to 20 sq. inch, minimum 1/16 inch thick.
 - b. For signs larger than 20 sq. inch, 1/8 inch thick.
 - c. Engraved legend with black letters on white face.
 - d. Punched or drilled for mechanical fasteners.

2.5 CABLE TIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. HellermannTyton.
 2. Ideal Industries, Inc.
 3. Marking Services Inc.
 4. Panduit Corp.
- B. Performance Criteria:
 1. Regulatory Requirements: Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 2. Listing Criteria: UL CCN ZODZ; including UL 1565 or UL 62275.
- C. UL ZODZ - General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black, except where used for color-coding.
- D. UL ZODZ - UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black.
- E. UL ZODZ - Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

- A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:
1. Fire-protection and fire-alarm equipment, including raceways, must be finished, painted, or suitably marked safety red.
 2. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft above finished floor.
- B. Pipe and Conduit Labeling: Comply with ASME A13.1.
- C. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for feeder and branch-circuit conductors.
1. Color must be factory applied or field applied for sizes larger than 6 AWG when permitted by authorities having jurisdiction.
 2. Colors for 240 V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 3. Color for Neutral (Grounded Conductor): White.
 4. Color for Equipment Ground: Green.
- D. Color-Coding Instructional Signs: Self-adhesive labels, including color code for grounded and ungrounded conductors.
- E. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:
1. "POWER".
 2. "Communications".

- F. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- G. Locations of Underground Lines: Underground-line warning tape for power and lighting.
- H. Vaults, Manholes, Handholes, and Pull and Junction Boxes, 1000 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive vinyl tape to identify phase.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
 - 2. Identify system voltage with black letters on orange field.
- I. Accessible Raceways , 1000 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
 - 2. Identify system voltage with black letters on orange field.
- J. Cover Plates: Label individual cover plates with self-adhesive labels. Place label at top of cover plate. Label cover plate with the following information, in the order listed:
 - 1. Panelboard designation.
 - 2. Colon or dash.
 - 3. Branch circuit number.
- K. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in direction of access to live parts. Workspace must comply with CEC and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- L. Equipment Identification Labels:
 - 1. Black letters on white field.
 - 2. Indoor Equipment: Laminated acrylic or melamine plastic sign.
 - 3. Outdoor Equipment: Laminated acrylic or melamine sign.
 - 4. Equipment to Be Labeled:
 - a. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels containing equipment designation.
 - b. Panelboards: Typewritten directory of circuits in location provided by panelboard manufacturer. Panelboard identification must be in form of engraved, laminated acrylic or melamine label, attached with screws.
 - c. Enclosures and electrical cabinets.
 - d. Access doors and panels for concealed electrical items.
 - e. Contactors.
 - f. Remote-controlled switches, dimmer modules, and control devices.
 - g. Monitoring and control equipment.
- M. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In all above-ceiling spaces: Plenum rated.

3.3 SELECTION OF SIGNS AND HAZARD MARKINGS

- A. Comply with 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs.
 - B. Signs, labels, and tags required for personnel safety must comply with the following standards:
 1. Safety Colors: NEMA Z535.1.
 2. Facility Safety Signs: NEMA Z535.2.
 3. Safety Symbols: NEMA Z535.3.
 4. Product Safety Signs and Labels: NEMA Z535.4.
 5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.
 - C. Electrical Hazard Warnings:
 1. Arc-Flash Hazard Warning: Self-adhesive labels. Comply with NFPA 70E and Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash hazard warning labels.
 2. Multiple Power Sources Warning Legend: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 3. OSHA Workspace Clearance Warning Legend: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 3 FEET MINIMUM."
 - D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.
 1. Apply to exterior of door, cover, or other access.
 2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
 - a. Power-transfer switches.
 - b. Controls with external control power connections.
 - E. Operating Instruction Signs: Laminated acrylic or melamine plastic signs.
 - F. Emergency Operating Instruction Signs: Laminated acrylic or melamine plastic signs with white legend on red background with minimum 3/8 inch high letters for emergency instructions at equipment used for power transfer.
- ### 3.4 SELECTION OF IDENTIFICATION PRODUCTS FOR COMMUNICATIONS, CONTROL, AUXILIARY, AND LIFE SAFETY SYSTEMS
- A. Comply with Section 270528 "Pathways for Communications Systems" and Section 271100 "Communications Equipment Room Fittings."

3.5 INSTALLATION

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- C. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.
- D. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- E. Install identifying devices before installing acoustical ceilings and similar concealment.
- F. Verify identity of item before installing identification products.
- G. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- H. Apply identification devices to surfaces that require finish after completing finish work.
- I. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.
- K. Vinyl Wraparound Labels:
 - 1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.
- L. Snap-Around Labels: Secure tight to surface at location with high visibility and accessibility.
- M. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.
- N. Snap-Around Color-Coding Bands: Secure tight to surface at location with high visibility and accessibility.
- O. Heat-Shrink, Preprinted Tubes: Secure tight to surface at location with high visibility and accessibility.

- P. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.
- Q. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.
1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for minimum distance of 6 inch where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- R. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- S. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's instructions.
- T. Metal Tags:
1. Place in location with high visibility and accessibility.
 2. Secure using plenum-rated cable ties.
- U. Nonmetallic Preprinted Tags:
1. Place in location with high visibility and accessibility.
 2. Secure using plenum-rated cable ties.
- V. Write-on Tags:
1. Place in location with high visibility and accessibility.
 2. Secure using plenum-rated cable ties.
- Baked-Enamel Signs: Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
- Metal-Backed Butyrate Signs: Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
- W. Laminated Acrylic or Melamine Plastic Signs: Attach signs with mechanical fasteners appropriate to location and substrate.

END OF SECTION 260553

SECTION 260573.13 - SHORT-CIRCUIT STUDIES**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Computer-based, fault-current study to determine minimum interrupting capacity of circuit protective devices.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260573.16 "Coordination Studies" for overcurrent protective device coordination studies.
3. Section 260573.19 "Arc-Flash Hazard Analysis" for arc-flash studies.

1.2 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled. Existing to remain items must remain functional throughout construction period.
- B. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.
- D. SCCR: Short-circuit current rating.
- E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- F. Single-Line Diagram: See "One-Line Diagram."

1.3 ACTION SUBMITTALS**A. Product Data:**

1. For power system analysis software to be used for studies.

B. Short-Circuit Study Report:

1. Submit the following after approval of system protective devices submittals. Submittals must be in digital form.
 - a. Short-circuit study input data, including completed computer program input data sheets.
 - b. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
 - c. Revised one-line diagram, reflecting field investigation results and results of short-circuit study.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.5 QUALITY ASSURANCE

- A. Study must be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms must comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.

PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. EasyPower; brand of Bentley Systems, Inc.
 2. SKM Systems Analysis, Inc.
- B. Comply with IEEE 399 and IEEE 551.
- C. Analytical features of power systems analysis software program must have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- D. Computer software program must be capable of plotting and diagramming time-current-characteristic curves as part of its output.
- E. Computer program must be designed to perform short-circuit studies or have function, component, or add-on module designed to perform short-circuit studies.

- F. Computer program must be developed under supervision of licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram of modeled power system, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Conductor types, sizes, and lengths.
 - 3. Motor and generator designations and kVA ratings.
 - 4. Switchboard, and panelboard designations and ratings.
 - 5. Derating factors and environmental conditions.
 - 6. Any revisions to electrical equipment required by study.
- D. Comments and recommendations for system improvements or revisions in written document, separate from one-line diagram.
- E. Protective Device Evaluation:
 - 1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.
 - 2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
 - 3. For 600 V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
 - 4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
 - 5. Verify adequacy of phase conductors at maximum phase-to-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
- F. Short-Circuit Study Input Data:
 - 1. One-line diagram of system being studied.
 - 2. Power sources available.
 - 3. Manufacturer, model, and interrupting rating of protective devices.
 - 4. Conductors.
- G. Short-Circuit Study Output Reports:
 - 1. Low-Voltage Fault Report: Phase-to-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

- a. Voltage.
- b. Calculated fault-current magnitude and angle.
- c. Fault-point X/R ratio.
- d. Equivalent impedance.

PART 3 - EXECUTION**3.1 POWER SYSTEM DATA**

- A. Obtain data necessary for conduct of study.
 1. Verify completeness of data supplied on one-line diagram. Call discrepancies to Architect's attention.
 2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
 3. For equipment that is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers in accordance with NFPA 70E.
- B. Gather and tabulate required input data to support short-circuit study. Comply with requirements in Section 017839 "Project Record Documents" for recording circuit protective device characteristics. Record data on Record Document copy of one-line diagram. Comply with recommendations in IEEE 551 as to amount of detail that is required to be acquired in field. Field data gathering must be by, or under supervision of, qualified electrical professional engineer. Data include, but are not limited to, the following:
 1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 2. Obtain electrical power utility contribution at service from published maximum short circuit values.
 3. Power sources and ties.
 4. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
 5. Motor horsepower and NEMA MG 1 code letter designation.
 6. Conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
 7. Derating factors.

3.2 SHORT-CIRCUIT STUDY

- A. Perform study following general study procedures contained in IEEE 399.
- B. Calculate short-circuit currents according to IEEE 551.
- C. Base study on device characteristics supplied by device manufacturer.

- D. Extent of electrical power system to be studied is indicated on Drawings.
- E. Begin short-circuit current analysis at service, extending down to system overcurrent protective devices as follows:
 - 1. To normal system low-voltage load buses where fault current is 2 kA or greater.
- F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- G. Include ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low-voltage, ac systems. Also account for fault-current dc decrement to address asymmetrical requirements of interrupting equipment.
- H. Calculate for phase-to-phase bolted fault and single line-to-ground fault at each equipment indicated on one-line diagram.
- I. Include in report identification of protective device applied outside its capacity.

END OF SECTION 260573.13

SECTION 260573.16 - COORDINATION STUDIES**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.
 - a. Study results must be used to determine coordination of any existing series-rated devices.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260573.13 "Short-Circuit Studies" for fault-current studies.
3. Section 260573.19 "Arc-Flash Hazard Analysis" for arc-flash studies.

1.2 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled. Existing to remain items must remain functional throughout construction period.
- B. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of electric circuit or system of circuits and the component devices or parts used therein.
- C. Protective Device: A device that senses when abnormal current flow exists and then removes the affected portion of the circuit from the system.
- D. SCCR: Short-circuit current rating.
- E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- F. Single-Line Diagram: See "One-Line Diagram."

1.3 ACTION SUBMITTALS**A. Product Data:**

1. For power system analysis software to be used for studies.

B. Coordination Study Report:

1. Submit the following after approval of system protective devices submittals. Submittals must be in digital form.
 - a. Coordination-study input data, including completed computer program input data sheets.
 - b. Study and equipment evaluation reports.
 - c. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
 - d. Revised one-line diagram, reflecting field investigation results and results of coordination study.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.5 QUALITY ASSURANCE

- A. Studies must be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms must comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.

PART 2 - PRODUCTS**2.1 POWER SYSTEM ANALYSIS SOFTWARE**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. EasyPower; brand of Bentley Systems, Inc.
 2. SKM Systems Analysis, Inc.
- B. Comply with IEEE 242 and IEEE 399.
- C. Analytical features of device coordination study computer software program must have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

- D. Computer software program must be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program must report device settings and ratings of overcurrent protective devices and must demonstrate selective coordination by computer-generated, time-current coordination plots.
- E. Computer program must be designed to perform coordination studies or have function, component, or add-on module designed to perform coordination studies.
- F. Computer program must be developed under supervision of licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

2.2 COORDINATION STUDY REPORT CONTENTS

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram of modeled power system, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Conductor types, sizes, and lengths.
 - 3. Motor and generator designations and kVA ratings.
 - 4. Switchboard, and panelboard designations.
 - 5. Revisions to electrical equipment required by study.
 - 6. Study Input Data: As described in "Power System Data" Article.
 - a. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."
- D. Protective Device Coordination Study:
 - 1. Report recommended settings of protective devices, ready to be applied in field. Use manufacturer's data sheets for recording recommended setting of overcurrent protective devices when available.
 - a. Circuit Breakers:
 - 1) Adjustable pickups and time delays (long time, short time, and ground).
 - 2) Adjustable time-current characteristic.
 - 3) Adjustable instantaneous pickup.
 - 4) Recommendations on improved trip systems, if applicable.
 - b. Fuses: Show current rating, voltage, and class.
- E. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices.

Prepare separate sets of curves for switching schemes and for emergency periods where power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying portion of system covered.
2. Terminate device characteristic curves at point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.
3. Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:
 - a. Power utility's overcurrent protective device.
 - b. Low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
 - c. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
 - d. Cables and conductors damage curves.
 - e. Motor-starting characteristics and motor damage points.
 - f. Generator short-circuit decrement curve and generator damage point.
 - g. Largest feeder circuit breaker in each motor-control center and panelboard.
5. Maintain selectivity for tripping currents caused by overloads.
6. Maintain maximum achievable selectivity for tripping currents caused by overloads on series-rated devices.
7. Provide adequate time margins between device characteristics such that selective operation is achieved.
8. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance of the Work. Devices to be coordinated are indicated on Drawings.
 1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 POWER SYSTEM DATA

- A. Obtain data necessary for conduct of overcurrent protective device study.
 1. Verify completeness of data supplied in one-line diagram on Drawings. Call discrepancies to Architect's attention.
 2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.

3. For equipment that is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. Qualifications of technicians and engineers must be in accordance with NFPA 70E.
- B. Gather and tabulate required input data to support coordination study. List below is guide. Comply with recommendations in IEEE 551 for amount of detail required to be acquired in field. Field data gathering must be by, or under supervision of, qualified electrical professional engineer. Data include, but are not limited to, the following:
 1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 2. Electrical power utility impedance at service.
 3. Power sources and ties.
 4. Short-circuit current at each system bus (phase-to-phase and line to ground).
 5. Full-load current of loads.
 6. Voltage level at each bus.
 7. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
 8. Maximum demands from service meters.
 9. Motor horsepower and NEMA MG 1 code letter designation.
 10. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
 11. Data sheets to supplement electrical distribution system one-line diagram, cross-referenced with tag numbers on diagram, showing the following:
 - a. Special load considerations, including starting inrush currents and frequent starting and stopping.
 - b. Ratings, types, and settings of utility company's overcurrent protective devices.
 - c. Special overcurrent protective device settings or types stipulated by utility company.
 - d. Time-current-characteristic curves of devices indicated to be coordinated.
 - e. Manufacturer, frame size, interrupting rating in amperes root mean square (rms) symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
 - f. Switchboards, and panelboards ampacity, and SCCR in amperes rms symmetrical.

3.3 COORDINATION STUDY

- A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.
- B. Comply with IEEE 399 for general study procedures.
- C. Base study on device characteristics supplied by device manufacturer.
- D. Extent of electrical power system to be studied is indicated on Drawings.

- E. Begin analysis at service, extending down to system overcurrent protective devices as follows:
 - 1. To normal system low-voltage load buses where fault current is 2 kA or greater.
- F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- G. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands maximum short-circuit current for time equivalent to tripping time of primary relay protection or total clearing time of fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.
- H. Include ac fault-current decay from induction motors, and asynchronous generators and apply to low-voltage, ac systems. Also account for fault-current dc decrement, to address asymmetrical requirements of interrupting equipment.
- I. Calculate for phase-to-phase bolted fault and single line-to-ground fault at each equipment indicated on one-line diagram.
 - 1. For grounded systems, provide bolted line-to-ground fault-current study for areas as defined for phase-to-phase bolted fault short-circuit study.
- J. Protective Device Evaluation:
 - 1. Evaluate equipment and protective devices and compare to short-circuit ratings.
 - 2. Adequacy of panelboard bus bars to withstand short-circuit stresses.
 - 3. Include in report identification of protective device applied outside its capacity.

3.4 FIELD ADJUSTING

- A. Adjust relay and protective device settings according to recommended settings provided by coordination study. Field adjustments must be completed by engineering service division of equipment manufacturer under "Startup and Acceptance Testing" contract portion.
- B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.
- C. Testing and adjusting must be by qualified low-voltage electrical testing and inspecting agency.
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for adjustable overcurrent protective devices.

END OF SECTION 260573.16

SECTION 260573.19 - ARC-FLASH HAZARD ANALYSIS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Computer-based, arc-flash study to determine arc-flash hazard distance and incident energy to which personnel could be exposed during work on or near electrical equipment.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260573.13 "Short-Circuit Studies" for fault-current studies.
3. Section 260573.16 "Coordination Studies" for overcurrent protective device coordination studies.

1.2 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- B. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.
- D. p.u.: Per unit. The reference unit, established as a calculating convenience, for expressing all power system electrical parameters on a common reference base.
- E. SCCR: Short-circuit current rating.
- F. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- G. Single-Line Diagram: See "One-Line Diagram."

1.3 ACTION SUBMITTALS**A. Product Data:**

1. For power system analysis software to be used for studies.

B. Study Submittals:

1. Submit the following after approval of system protective devices submittals. Submittals must be in digital form:
 - a. Arc-flash study input data, including completed computer program input data sheets.
 - b. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
 - c. Revised one-line diagram, reflecting field investigation results and results of arc-flash study.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.5 QUALITY ASSURANCE

- A. Study must be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms must comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. EasyPower; brand of Bentley Systems, Inc.
 2. SKM Systems Analysis, Inc.
- B. Comply with IEEE 1584 and NFPA 70E.
- C. Analytical features of device coordination study computer software program must have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- D. Computer program must be designed to perform arc-flash analysis or have function, component, or add-on module designed to perform arc-flash analysis.

- E. Computer program must be developed under supervision of licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

2.2 ARC-FLASH STUDY REPORT CONTENT

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Conductor types, sizes, and lengths.
 - 3. Motor and generator designations and kVA ratings.
 - 4. Switchboard, panelboard designations, and ratings.
- D. Study Input Data: As described in "Power System Data" Article.
- E. Short-Circuit Study Output Data: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."
- F. Protective Device Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."
- G. Incident Energy and Flash Protection Boundary Calculations:
 - 1. Arcing fault magnitude.
 - 2. Protective device clearing time.
 - 3. Duration of arc.
 - 4. Arc-flash boundary.
 - 5. Restricted approach boundary.
 - 6. Limited approach boundary.
 - 7. Working distance.
 - 8. Incident energy.
 - 9. Hazard risk category.
 - 10. Recommendations for arc-flash energy reduction.
- H. Fault study input data, case descriptions, and fault-current calculations including definition of terms and guide for interpretation of computer printout.

2.3 ARC-FLASH WARNING LABELS

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce 3.5 by 5 inch self-adhesive equipment label for each work location included in analysis.
- B. Label must have orange header with wording, "WARNING, ARC-FLASH HAZARD," and must include the following information taken directly from arc-flash hazard analysis:

ARC-FLASH HAZARD ANALYSIS

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DEHESA SCHOOL MODERNIZATION

1. Location designation.
 2. Nominal voltage.
 3. Protection boundaries.
 - a. Arc-flash boundary.
 - b. Restricted approach boundary.
 - c. Limited approach boundary.
 4. Required minimum arc rating of PPE in Cal/cm squared.
 5. Available incident energy.
 6. Working distance.
 7. Engineering report number, revision number, and issue date.
- C. Labels must be machine printed, with no field-applied markings.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

- A. Comply with NFPA 70E and its Annex D for hazard analysis study.
- B. Preparatory Studies: Perform Short-Circuit and Protective Device Coordination studies prior to starting Arc-Flash Hazard Analysis.
1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."
 2. Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."
- C. Calculate maximum and minimum contributions of fault-current size.
1. Maximum calculation must assume maximum contribution from utility and must assume motors to be operating under full-load conditions.
 2. Calculate arc-flash energy at 85 percent of maximum short-circuit current in accordance with IEEE 1584 recommendations.
 3. Calculate arc-flash energy with utility contribution at minimum and assume no motor contribution.
- D. Calculate arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.
- E. Include low-voltage equipment locations, except equipment where calculated short circuit current is less than 2KA.

- F. Calculate limited, restricted, and prohibited approach boundaries for each location.
- G. Incident energy calculations must consider accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations must take into account changing current contributions, as sources are interrupted or decremented with time. Fault contribution from motors and generators must be decremented as follows:
 - 1. Fault contribution from induction motors must not be considered beyond three to five cycles.
 - 2. Fault contribution from synchronous motors and generators must be decayed to match actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 p.u. to 3 p.u. after 10 cycles).
- H. Arc-flash energy must generally be reported for maximum of line or load side of circuit breaker. However, arc-flash computation must be performed and reported for both line and load side of circuit breaker as follows:
 - 1. When circuit breaker is in separate enclosure.
 - 2. When line terminals of circuit breaker are separate from work location.
- I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

- A. Obtain data necessary for conduct of arc-flash hazard analysis.
 - 1. Verify completeness of data supplied on one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to Architect's attention.
 - 2. For new equipment, use characteristics from approved submittals under provisions of action submittals and information submittals for this Project.
 - 3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys conducted by qualified technicians and engineers.
- B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to amount of detail that is required to be acquired in field. Field data gathering must be under direct supervision and control of engineer in charge of performing study, and must be by, or under supervision of, qualified electrical professional engineer. Data include, but are not limited to, the following:
 - 1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 - 2. Obtain electrical power utility impedance or available short circuit current at service.
 - 3. Power sources and ties.
 - 4. Short-circuit current at each system bus (phase-to-phase and line to ground).
 - 5. Full-load current of loads.

6. Voltage level at each bus.
7. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
8. Motor horsepower and NEMA MG 1 code letter designation.
9. Low-voltage conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.4 LABELING

- A. Apply one arc-flash label on front cover of each section of equipment for each equipment included in study. Base arc-flash label data on highest values calculated at each location.
- B. Each piece of equipment listed below where calculated short circuit current is 2KA or greater must have arc-flash label applied to it:
 1. Switchboards.
 2. Panelboards.
 3. Safety switches.
 4. Control panels, including HVAC control panels.
- C. Note on Record Drawings location of equipment where personnel could be exposed to arc-flash hazard during their work.
 1. Indicate arc-flash energy.
 2. Indicate protection level required.

3.5 APPLICATION OF WARNING LABELS

- A. Install arc-flash warning labels under direct supervision and control of qualified electrical professional engineer.

END OF SECTION 260573.19

SECTION 260923 - LIGHTING CONTROL DEVICES**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Daylight-harvesting switching controls.
2. Daylight-harvesting dimming controls, analog.
3. Daylight-harvesting dimming controls, digital.
4. Indoor occupancy and vacancy sensors.
5. Conductors and cables.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.2 ACTION SUBMITTALS**A. Product Data:**

1. Daylight-harvesting switching controls.
2. Daylight-harvesting dimming controls, analog.
3. Daylight-harvesting dimming controls, digital.
4. Indoor occupancy and vacancy sensors.
5. Conductors and cables.

B. Shop Drawings:

1. Show installation details for the following:
 - a. Occupancy sensors.
 - b. Vacancy sensors.
2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

C. Field quality-control reports.**1.3 INFORMATIONAL SUBMITTALS**

- A. Sample Warranty: For manufacturer's warranties.

1.4 WARRANTY

- A. Special Extended Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace, including labor, materials, and equipment, devices that fail to perform as specified within extended warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of lighting control software.
 - b. Faulty operation of lighting control devices.
 - 2. Extended Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 DAYLIGHT-HARVESTING SWITCHING CONTROLS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. Hubbell Control Solutions; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - 3. Leviton Manufacturing Co., Inc.
 - 4. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - 5. WattStopper; Legrand North America, LLC.
- B. Description: System operates indoor lighting.
- C. Sequence of Operation: As daylight increases, the lights are turned off at a predetermined level. As daylight decreases, the lights are turned on at a predetermined level.
 - 1. Lighting control set point is based on two lighting conditions:
 - a. When no daylight is present.
 - b. When significant daylight is present (target level).
 - c. System programming is done with two hand-held, remote-control tools.
- D. Ceiling-Mounted Switching Controls:
 - 1. Solid-state, light-level sensor unit, with power pack, that detects changes in indoor lighting levels that are perceived by the eye.
- E. Electrical Components, Devices, and Accessories:
 - 1. Listed and labeled in accordance with CEC, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.

3. Sensor Output:
 - a. Contacts rated to operate the associated power pack, complying with UL 773A. Sensor must be powered by the power pack.
 - b. Digital signal compatible with power pack.
4. Sensor type: Open loop.
5. Zone: Single.
6. Power Pack:
 - a. Dry contacts rated for 20 A ballast or LED load at 120- and 277 V(ac), for 13 A tungsten at 120 V(ac), and for 1 hp at 120 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source.
 - 1) LED status lights to indicate load status.
 - 2) Plenum rated.
 - b. Digital controller capable of accepting 3 8PSJ inputs with two outputs rated for 20 A incandescent or LED load at 120 and 277 V(ac), for 16 A ballast or LED at 120 and 277 V(ac), and for 1 hp at 120 V(ac). Sensor has 24 V(dc) Class 2 power source.
 - 1) With integral current monitoring
 - 2) Compatible with digital addressable lighting interface.
 - 3) Plenum rated.
7. General Space Sensors Light-Level Monitoring Range: 10 to 200 fc, with an adjustment for turn-on and turn-off levels within that range.
8. Atrium Space Sensors Light-Level Monitoring Range: 100 to 1000 fc, with an adjustment for turn-on and turn-off levels within that range.
9. Skylight Sensors Light-Level Monitoring Range: 1000 to 10 000 fc, with an adjustment for turn-on and turn-off levels within that range.
10. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling.
11. Set-Point Adjustment: Equip with deadband adjustment of 25, 50, and 75 percent above the "on" set point, or provide with separate adjustable "on" and "off" set points.
12. Test Mode: User selectable, overriding programmed time delay to allow settings check.
13. Control Load Status: User selectable to confirm that load wiring is correct.
14. Indicator: Two digital displays to indicate the beginning of on-off cycles.

2.2 DAYLIGHT-HARVESTING DIMMING CONTROLS, ANALOG

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton.
 2. Hubbell Control Solutions; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 3. Leviton Manufacturing Co., Inc.
 4. Lithonia Lighting; Acuity Brands Lighting, Inc.
 5. WattStopper; Legrand North America, LLC.

- B. Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, the lights are dimmed.
1. Lighting control set point is based on two lighting conditions:
 - a. When no daylight is present (target level).
 - b. When significant daylight is present.
 2. System programming is done with two hand-held, remote-control tools.
 - a. Initial setup tool.
 - b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.
- C. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with **[integrated]** separate power pack, to detect changes in indoor lighting levels that are perceived by the eye.
- D. Electrical Components, Devices, and Accessories:
1. Listed and labeled in accordance with CEC, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 2. Sensor Output: zero to 10 V(dc) to operate luminaires. Sensor is powered by controller unit.
 3. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc.
- E. Power Pack: Dry contacts rated for 20 A ballast or LED load at 120 and 277 V(ac), for 13 A tungsten at 120 V(ac), and for 1 hp at 120 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source
1. LED status lights to indicate load status.
 2. Plenum rated.

2.3 DAYLIGHT-HARVESTING DIMMING CONTROLS, DIGITAL

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
 2. Hubbell Control Solutions; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 3. Leviton Manufacturing Co., Inc.
 4. Lithonia Lighting; Acuity Brands Lighting, Inc.
 5. WattStopper; Legrand North America, LLC.
- B. Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, lights are dimmed.
1. Lighting control set point is based on the following two lighting conditions:
 - a. When no daylight is present (target level).

- b. When significant daylight is present.
- 2. System programming is done with two hand-held, remote-control tools.
 - a. Initial setup tool.
 - b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.
- C. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with **[integrated]** separate power pack, to detect changes in indoor lighting levels that are perceived by the eye.
- D. Electrical Components, Devices, and Accessories:
 - 1. Listed and labeled in accordance with CEC, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Sensor Output: zero to 10 V(dc) to operate luminaires. Sensor is powered by controller unit.
 - 3. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc.
- E. Power Pack: Digital controller capable of accepting three 8PSJ inputs with two output(s) rated for 20 A incandescent or LED load at 120 and 277 V(ac), for 16 A ballast load or LED at 120 and 277 V(ac), and for 1 hp at 120 V(ac). Sensor has 24 V(dc) Class 2 power source.
 - 1. With integral current monitoring.
 - 2. Compatible with digital addressable lighting interface.
 - 3. Plenum rated.

2.4 INDOOR OCCUPANCY AND VACANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. Hubbell Control Solutions; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - 3. Leviton Manufacturing Co., Inc.
 - 4. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - 5. Lutron Electronics Co., Inc.
 - 6. Sensor Switch, Inc.
 - 7. WattStopper; Legrand North America, LLC.
- B. General Requirements for Sensors:
 - 1. Wall and Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
 - 2. Dual technology.
 - 3. Separate power pack.
 - 4. Hardwired connection to switch; and BAS and lighting control system.
 - 5. Listed and labeled in accordance with CEC, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

6. Operation:
 - a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 7. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A] Sensor is powered from the power pack.
 8. Power: Line voltage.
 9. Power Pack: Dry contacts rated for 20 A LED load at 120 and 277 V(ac), for 13 A tungsten at 120 V(ac), and for 1 hp at 120 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source.
 10. Mounting:
 - a. Sensor: Suitable for mounting in any position in a standard device box or outlet box.
 - b. Relay: Externally mounted through a 1/2 inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 12. Bypass Switch: Override the "on" function in case of sensor failure.
 13. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6 inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch, and detect a person of average size and weight moving not less than 12 inch in either a horizontal or a vertical manner at an approximate speed of 12 inch/s.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96 inch high ceiling.

2.5 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 24 AWG. Comply with requirements in Section 260519 "Low-Voltage

Electrical Power Conductors and Cables."

- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF SENSORS

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's instructions.

3.3 INSTALLATION OF WIRING

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch.
- B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's instructions.
- C. Size conductors in accordance with lighting control device manufacturer's instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring in accordance with Section 260553 "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.

2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

- B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

- A. Field tests must be witnessed by authorities having jurisdiction.

- B. Tests and Inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- C. Nonconforming Work:

1. Lighting control devices will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

- D. Prepare test and inspection reports.

- E. Manufacturer Services:

1. Engage factory-authorized service representative to support field tests and inspections.

3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.7 MAINTENANCE

- A. Software and Firmware Service Agreement:

1. Technical Support: Beginning at Substantial Completion, verify that software and firmware service agreement includes software support for two years.
2. Upgrade Service: At Substantial Completion, update software and firmware to latest

version. Install and program software upgrades that become available within two years from date of Substantial Completion. Verify upgrading software includes operating system and new or revised licenses for using software.

- a. Upgrade Notice: No fewer than 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.
3. Upgrade Reports: Prepare written report after each update, documenting upgrades installed.

END OF SECTION 260923

SECTION 262416 - PANELBOARDS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Lighting and appliance branch-circuit panelboards.
 - 2. Disconnecting and overcurrent protective devices.
- B. Related Requirements:
 - 1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 DEFINITIONS

- A. MCCB: Molded-case circuit breaker.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
 - 1. Lighting and appliance branch-circuit panelboards.
 - 2. Disconnecting and overcurrent protective devices.
 - 3. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
 - 4. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Field Quality-Control Submittals:
 - 1. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

- A. Panelboard Schedules: For installation in panelboards.
- B. Manufacturers' Published Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:
 - 1. Recommended procedures for installing panelboards.
 - 2. Recommended torque settings for bolted connections on panelboards.
 - 3. Recommended temperature range for energizing panelboards.

1.5 CLOSEOUT SUBMITTALS

- A. Warranty documentation.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Spare Parts: Furnish to Owner spare parts, for repairing panelboards, that are packaged with protective covering for storage on-site and identified with labels describing contents. Include the following:
 - 1. Keys: Two spares for each type of panelboard cabinet lock.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation in accordance with NECA 407.

1.8 WARRANTY

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed panelboards perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.
 - 1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS**2.1 PANELBOARDS COMMON REQUIREMENTS**

- A. Fabricate and test panelboards in accordance with IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with CEC, by qualified electrical testing agency recognized by authorities having jurisdiction and marked for intended location and application.
- D. Comply with NEMA PB 1.
- E. Comply with CBC.

- F. Enclosures: Flush -mounted, dead-front cabinets.
1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: UL 50E, Type 1.
 2. Height: 5 ft maximum.
 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims must cover live parts and may have no exposed hardware.
 4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims must cover live parts and may have no exposed hardware.
 5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
 6. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
 7. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Same finish as panels and trim.
- G. Incoming Mains:
1. Location: Top.
 2. Main Breaker: Main lug interiors up to 400 A must be field convertible to main breaker.
- H. Phase, Neutral, and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
 - a. Plating must run entire length of bus.
 - b. Bus must be fully rated for entire length.
 2. Interiors must be factory assembled into unit. Replacing switching and protective devices may not disturb adjacent units or require removing main bus connectors.
 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure.
- I. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Tin-plated aluminum.
 2. Terminations must allow use of 75 deg C rated conductors without derating.
 3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
 4. Main and Neutral Lugs: Mechanical type, with lug on neutral bar for each pole in panelboard.
 5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with lug on bar for

each pole in panelboard.

- J. Quality-Control Label: Panelboards or load centers must be labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers must have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- K. Future Devices: Panelboards or load centers must have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
 - 1. Percentage of Future Space Capacity: 20 percent.
- L. Panelboard Short-Circuit Current Rating:
 - 1. Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for 100 percent interrupting capacity.
 - a. Panelboards and overcurrent protective devices rated 240 V or less must have short-circuit ratings as shown on Drawings, but not less than 10 000 A(rms) symmetrical.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. Siemens Industry, Inc., Energy Management Division.
 - 3. Square D; Schneider Electric USA.
- B. Listing Criteria: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturer shall be same as panelboard manufacturer.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet 110% of calculated available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.

- b. Instantaneous magnetic trip element for short circuits.
- 2. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6 mA trip).
- 3. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in CEC.
- B. Receive, inspect, handle, and store panelboards in accordance with NECA 407.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
 - 1. Panelboards: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NECA 407.
 - 2. Consult Architect for resolution of conflicting requirements.
- C. Special Techniques:
 - 1. Equipment Mounting:
 - a. Attach panelboard to vertical finished or structural surface behind panelboard.
 - b. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."

PANELBOARDS

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DEHESA SCHOOL MODERNIZATION

2. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
3. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
4. Mount top of trim 84 inches above finished floor unless otherwise indicated.
5. Mount panelboard cabinet plumb and rigid without distortion of box.
6. Install overcurrent protective devices not already factory installed.
 - a. Set field-adjustable, circuit-breaker trip ranges.
 - b. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver in accordance with manufacturer's published instructions.
7. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
8. Install filler plates in unused spaces.
9. Stub four 1 inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in future. Stub four 1 inch empty conduits into raised floor space or below slab not on grade.
10. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
11. Mount spare fuse cabinet in accessible location.

D. Interfaces with Other Work:

1. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Panelboard Nameplates: Label each panelboard with nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- C. Device Nameplates: Label each branch circuit device in power panelboards with nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.
- E. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles must be located on interior of panelboard door.
- F. Breaker Labels: Faceplate must list current rating, UL and IEC certification standards, and AIC

rating.

G. Circuit Directory:

1. Provide directory card inside panelboard door, mounted in transparent card holder.
 - a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.
2. Provide computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
 - a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.
3. Create directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Field tests and inspections must be witnessed by authorities having jurisdiction.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Do not perform optional tests. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
 - c. Instruments and Equipment:
 - 1) Use infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

D. Nonconforming Work:

1. Panelboards will be considered defective if they do not pass tests and inspections.
 2. Remove and replace defective units and retest.
- E. Collect, assemble, and submit test and inspection reports, including certified report that identifies panelboards included and that describes scanning results, with comparisons of two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- F. Manufacturer Services:
1. Engage factory-authorized service representative to support field tests and inspections.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. General-use switches and dimmer switches.
2. General-grade duplex straight-blade receptacles.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260923 "Lighting Control Devices" for occupancy sensors, timers, control-voltage switches, and control-voltage dimmers.
3. Section 262726.11 "General-Use Switches, Dimmer Switches, and Fan-Speed Controller Switches" for additional wiring device products.

1.2 DEFINITIONS

- A. UL 1472 Type I Dimmer: Dimmer in which air-gap switch is used to energize preset lighting levels.

1.3 ACTION SUBMITTALS**A. Product Data:**

1. General-use switches and dimmer switches.
2. General-grade duplex straight-blade receptacles.

B. Field quality-control reports.**1.4 INFORMATIONAL SUBMITTALS**

- A. Manufacturers' Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:

1. Dimmers.
2. Duplex straight-blade receptacles.
3. Receptacles with GFCI device.

B. Sample warranties.

PART 2 - PRODUCTS**2.1 GENERAL-USE SWITCHES AND DIMMER SWITCHES****A. Dimmer Switch:****1. Regulatory Requirements:**

- a. Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. General Characteristics:

- a. Reference Standards: UL CCN EOYX and UL 1472 Type I dimmer.

3. Options:

- a. Device Color: White.
- b. Switch Style: Rocker.
- c. Dimming Control Style: Slide.

4. Accessories:

- a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
- b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.2 GENERAL-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES**A. Duplex Straight-Blade Receptacle:****1. Regulatory Requirements:**

- a. Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. General Characteristics:

- a. Reference Standards: UL CCN RTRT and UL 498.

3. Options:

- a. Device Color: White.
- b. Configuration:
 - 1) Heavy-duty, NEMA 5-20R.

4. Accessories:

- a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.
- B. Tamper-Resistant Duplex Straight-Blade Receptacle:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. General Characteristics:
 - a. Reference Standards: UL CCN RTRT and UL 498.
 - 3. Options:
 - a. Device Color: White.
 - b. Configuration:
 - 1) Heavy-duty, NEMA 5-20R.
 - 4. Accessories:
 - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.
- C. Wired Full-Controlled Duplex Straight-Blade Receptacle:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. General Characteristics:
 - a. Reference Standards: UL CCN RTX1 and UL Subject 498B.
 - 3. Options:
 - a. Device Color: White.
 - b. Configuration: NEMA 5-20R.
 - 4. Accessories:
 - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

D. Wired Half-Controlled Duplex Straight-Blade Receptacle:

1. Regulatory Requirements:
 - a. Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. General Characteristics:
 - a. Reference Standards: UL CCN RTX1 and UL Subject 498B.
3. Options:
 - a. Device Color: White.
 - b. Configuration: NEMA 5-20R.
4. Accessories:
 - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

E. General-Grade, Weather-Resistant, Tamper-Resistant Duplex Straight-Blade Receptacle with GFCI Device

1. Regulatory Requirements:
 - a. Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. General Characteristics:
 - a. Reference Standards: UL CCN KCXS, UL 498, and UL 943.
3. Options:
 - a. Device Color: White.
 - b. Configuration: Heavy-duty, NEMA 5-20R.
4. Accessories:
 - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

PART 3 - EXECUTION**3.1 EXAMINATION****A. Receptacles:**

1. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

3.2 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES**A. Comply with manufacturer's instructions.****B. Reference Standards:**

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
3. Receptacle Orientation: Unless otherwise indicated in Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.
4. Consult Architect for resolution of conflicting requirements.

C. Identification:

1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."
 - a. Mark cover or cover plate using hot, stamped, or engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.

3.3 FIELD QUALITY CONTROL OF STRAIGHT-BLADE RECEPTACLES**A. Tests and Inspections:**

1. Insert and remove test plug to verify that device is securely mounted.
2. Verify polarity of hot and neutral pins.
3. Measure line voltage.
4. Measure percent voltage drop.
5. Perform additional installation and maintenance inspections and diagnostic tests in accordance with NECA NEIS 130 and manufacturers' instructions.

B. Nonconforming Work:

1. Device will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

- C. Assemble and submit test and inspection reports.
- D. Manufacturer Services:
 - 1. Engage factory-authorized service representative to support field tests and inspections.

3.4 ADJUSTING

- A. Occupancy Adjustments for Controlled Receptacles: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.5 PROTECTION

- A. Devices:
 - 1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.
 - 2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 262726

SECTION 265119 - LED INTERIOR LIGHTING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes interior LED luminaires.
- B. Related Requirements:
 - 1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.
 - 3. Include physical description and dimensions of luminaires.
 - 4. Include emergency lighting units, including batteries and chargers.
 - 5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
 - 6. Photometric data and adjustment factors based on laboratory tests IES LM-79 and IES LM-80.

- a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
 - b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
- B. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing laboratory providing photometric data for luminaires.
- B. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.
- 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Product Certificates: For each type of luminaire.
- D. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
- 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 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. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications:
- 1. Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy

Efficient Lighting Products.

2. Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

- B. Provide luminaires from a single manufacturer for each luminaire type.
- C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance:
 1. Luminaires shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
 2. Luminaires and lamps shall be labeled vibration and shock resistant.
 3. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."
- B. Ambient Temperature: 41 to 104 deg F.
 1. Relative Humidity: Zero to 95 percent.
- C. Altitude: Sea level to <3000 feet.

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.

- B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following characteristics:
 - a. CCT and CRI.
- C. Recessed luminaires shall comply with NEMA LE 4.
- D. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- E. California Title 24 compliant.

2.3 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging.
- B. Steel:
 - 1. ASTM A36/A36M for carbon structural steel.
 - 2. ASTM A568/A568M for sheet steel.
- C. Stainless Steel:
 - 1. Manufacturer's standard grade.
 - 2. Manufacturer's standard type, ASTM A240/240M.
- D. Galvanized Steel: ASTM A653/A653M.
- E. Aluminum: ASTM B209.

2.4 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.5 LUMINAIRE SUPPORT

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish

same as luminaire.

- C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

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 luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

- A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and servicing.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- E. Flush-Mounted Luminaires:
 - 1. Secured to outlet box.
 - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 - 3. Trim ring flush with finished surface.
- F. Wall-Mounted Luminaires:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

G. Suspended Luminaires:

1. Ceiling Mount:
 - a. Pendant mount with 5/32-inch- diameter aircraft cable supports adjustable to 10 feet in length.
2. Pendants and Rods: Where longer than 12 inches, brace to limit swinging.
3. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

H. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion,

provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119

SECTION 265213 - EMERGENCY AND EXIT LIGHTING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Emergency lighting.
2. Exit signs.
3. Materials.
4. Luminaire support components.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 DEFINITIONS

- A. Correlated Color Temperature (CCT): The absolute temperature, measured in kelvins, of a blackbody whose chromaticity most nearly resembles that of the light source.
- B. Color Rendering Index (CRI): Measure of the degree of color shift that objects undergo when illuminated by the light source as compared with the color of those same objects when illuminated by a reference source.
- C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.
- D. Lumen (lm): The SI derived unit of luminous flux equal to the luminous flux emitted within a unit solid angle by a unit point source (1 lm = 1 cd-sr).

1.3 ACTION SUBMITTALS**A. Product Data:**

1. For each type of emergency lighting unit, exit sign, and emergency lighting support.
 - a. Include data on features, accessories, and finishes.
 - b. Include physical description of unit and dimensions.
 - c. Battery and charger for light units.
 - d. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
 - e. Include photometric data and adjustment factors based on laboratory tests by, or

under supervision of, qualified luminaire photometric testing laboratory, for each luminaire type.

B. Product Schedule:

1. For emergency lighting units. Use same designations indicated on Drawings.
2. For exit signs. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of luminaire.
- B. Product Test Reports: For each luminaire for tests performed by, or under supervision of, qualified luminaire photometric testing laboratory.
- C. Sample Warranty: For manufacturer's special warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.6 WARRANTY

- A. Special Installer Extended Warranty for Emergency and Exit Lighting: Installer warrants that fabricated and installed emergency luminaires and exit signs, including batteries, perform in accordance with specified requirements and agrees to repair or replace components and assemblies that fail to perform as specified within extended warranty period.
 1. Extended Warranty Period: Two year(s) from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

- A. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with CEC and UL 924, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
- B. Comply with CBC.
- C. Comply with NEMA LE 4 for recessed luminaires.
- D. Comply with UL 1598 for fluorescent luminaires.

2.2 EMERGENCY LIGHTING

- A. General Characteristics: Self-contained units.
- B. Remote Emergency Lighting Unit:
 - 1. Options:
 - a. Operating at nominal voltage of 120 V(ac).
 - b. Wall with universal junction box adaptor.
 - c. UV stable thermoplastic housing.
 - d. LED lamp heads.
 - e. External emergency power unit.

2.3 EXIT SIGNS

- A. General Characteristics: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Sign:
 - 1. Options:
 - a. Operating at nominal voltage of 120 V(ac).
 - b. Lamps for AC Operation:
 - 1) LEDs; 50,000 hours minimum rated lamp life.
 - c. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.

2.4 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components must be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access:
 - 1. Smooth operating, free of light leakage under operating conditions.
 - 2. Designed to permit relamping without use of tools.
 - 3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Housings:
 - 1. Extruded aluminum housing.
- D. Conduit: EMT, minimum metric designator 21 (trade size 3/4).

2.5 METAL FINISHES

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.6 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Support Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 0.106 inch.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- B. Install lamps in each luminaire.
- C. Supports:
 - 1. Sized and rated for luminaire and emergency power unit weight.
 - 2. Able to maintain luminaire position when testing emergency power unit.
 - 3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
 - 4. Luminaire-mounting devices must be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.
- D. Wall-Mounted Luminaire Support:
 - 1. Attached to structural members in walls.

2. Do not attach luminaires directly to gypsum board.

E. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 12 inch, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

F. Ceiling Grid Mounted Luminaires:

1. Secure to outlet box, if provided.
2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:
1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- C. Nonconforming Work:
1. Luminaire will be considered defective if it does not pass operation tests and inspections.
 2. Remove and replace defective units and retest.
- D. Prepare test and inspection reports.
- E. Manufacturer Services:
1. Engage factory-authorized service representative to support field tests and inspections.

3.5 PROTECTION

- A. Remove and replace luminaires and exit signs that are damaged or caused to be unfit for use by construction activities.

END OF SECTION 265213

SECTION 27 05 26
GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL**1.1 SUMMARY****A. Section Includes:**

1. Selection and installation of communications busbars.
2. Selection and installation of communications bonding conductors.

1.2 DEFINITIONS

- A. BBC: Backbone bonding conductor, for connecting multiple TBBs serving the same floor.
- B. PBB: Primary bonding busbar, located in main distribution frame room, ideally near electrical service entrance.
- C. RBB: Rack bonding busbar, located in equipment cabinets and racks.
- D. SBB: Secondary bonding busbar, located in intermediate distribution frame rooms.
- E. TBB: Telecommunications bonding backbone, for connecting SBBs to PBB.
- F. TBC: Telecommunications bonding conductor, for connecting PBB to intersystem bonding termination device or busbar at electrical service entrance.
- G. TEBC: Telecommunications equipment bonding conductor, for connecting RBBs to SBBs or PBB.
- H. UBC: Unit bonding conductor, for connecting individual communications equipment to RBBs or SBBs.

1.3 ACTION SUBMITTALS**A. Shop Drawings:**

1. For communications equipment room signal reference grid.
2. Include plans, elevations, sections, details, and attachments to other work.

B. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

- A. Manufacturers' Published Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:
 - 1. Installing wire connector on conductor.
 - 2. Recommended torque values.

1.5 CLOSEOUT SUBMITTALS

- A. Record Documentation: Project record documents in accordance with Section 017839 "Project Record Documents" must include locations of PBB and SBBs, and routing of TBC, TBBs, and BBCs.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION**

3.1 All grounding shall be in compliance with CEC Article 250.

3.2 EXAMINATION

- A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.
- B. Inspect test results of grounding system measured at point of TBC connection.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of TBC only after unsatisfactory conditions have been corrected.

3.3 SELECTION OF COMMUNICATIONS BUSBARS

- A. Unless otherwise indicated in this Section or on Drawings, provide products specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. PBB:
 - 1. Dimensions: 1/4 inch thick by 4 inch high.
 - 2. Stand-Off Distance: 2 inch.

C. SBB:

1. Dimensions: 1/4 inch thick by 4 inch high.
2. Stand-Off Distance: 2 inch.

3.4 SELECTION OF COMMUNICATIONS BONDING CONDUCTORS

- A. Unless otherwise indicated in this Section or on Drawings, provide products specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Communications Busbar Connections:
 1. TBC: Not smaller than 1/0 AWG and no smaller than largest TBB.
 2. TBB: Not smaller than 2 kcmil per linear ft of conductor length, but not larger than 750 kcmil, unless otherwise indicated on Drawings.
 3. BBC: Not smaller than largest TBB to which it is connected unless otherwise indicated on Drawings.
 4. TEBC: Not smaller than 2 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
 5. UBC: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
 6. Bonding Conductors to Structural Steel: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted clamp connectors.

3.5 INSTALLATION OF BONDING FOR COMMUNICATIONS

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
 1. Bonding of Communications: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with BICSI N3.
 2. Consult Architect for resolution of conflicting requirements.
- C. Special Techniques:
 1. Busbars:
 - a. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 12 inch above finished floor unless otherwise indicated.
 - b. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
 2. Conductors:

- a. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
 - b. Assemble wire connector to conductor, complying with manufacturer's published instructions and as follows:
 - 1) Use crimping tool and die specific to connector.
 - 2) Pretwist conductor.
 - 3) Apply antioxidant compound to bolted and compression connections.
 - c. Install in straightest and shortest route between origination and termination point, and no longer than required. Bend radius must not be smaller than 10 times diameter of conductor. No single bend may exceed 90 degrees.
 - d. Install without splices.
 - e. Support conductors at not more than 36 inch intervals.
 - f. Outside telecommunications rooms, install conductors in metric designator 21 (trade size 3/4) PVC-80 conduit until conduit enters telecommunications room. Install bonding conductors in EMT-A or EMT-SS when routed through plenum. Do not install bonding conductors in EMT-S unless otherwise indicated on Drawings.
 - 1) If bonding conductor must be installed in EMT-S or other ferrous metallic raceway, bond conductor to raceway using grounding bushing that complies with Section 270528 "Pathways for Communications Systems," and bond both ends of raceway to SBB.
- 3. Provide TBC and terminate ends to PBB and intersystem bonding termination device busbar at electrical service entrance in accordance with Section 250.94, "Bonding for Communication Systems," of CEC.
 - 4. Busbar Interconnections: Bond SBBs to PBB with TBBs. If more than one TBB is installed, bond TBBs together BBCs where required by TIA-607.
 - 5. Structural Steel: Where structural steel of steel frame building is readily accessible within room or space, bond each SBB and PBB to vertical steel of building frame.
 - 6. Communications Enclosures: Bond metallic enclosures of telecommunications equipment with UBCs to nearest SBB or PBB.
 - 7. Equipment Racks: Bond metallic components of enclosures to RBB using UBCs. Provide horizontally mounted RBB if not provided by enclosure or rack manufacturer. Bond RBB to SBB with TEBC. Power connection must comply with CEC; equipment grounding conductor in power cord of cord- and plug-connected equipment must be considered supplemental to bonding requirements in this Section.

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8. Shielded Cable: Bond shield of shielded cable to SBB in communications rooms and spaces. Comply with TIA-568.1 and TIA-568.2 when grounding shielded balanced twisted-pair cables.
9. Primary Protector: Bond to PBB with insulated bonding conductor.
10. Electrical Power Panelboards: Where electrical panelboards for communications equipment are located in same room or space, bond each ground bar of panelboard to SBB.
11. Cable Trays: Provide continuous electrical path by installing bonding clips and jumpers. Bond each end to nearest SBB.
12. Ladder Racks: Provide continuous electrical path by installing bonding clips and jumpers. Bond each end to nearest SBB.
13. Access Floors: Bond metal parts of access floors to SBB.

3.6 IDENTIFICATION

- A. Comply with Section 270553 "Identification for Communications Systems."
- B. Labels must be preprinted or computer-printed type.
 1. Label PBB(s) with "ts-PBB," where "ts" is telecommunications space identifier for location of PBB.
 2. Label SBB(s) with "ts-SBB," where "ts" is telecommunications space identifier for location of SBB.
 3. Label TBC, TBBs, and BBCs at attachment points with legend: "WARNING! COMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.7 FIELD QUALITY CONTROL

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:
 1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench according to manufacturer's published instructions.
 2. Test bonding connections of system using AC earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing PBB or SBB, using process recommended by BICSI N1. Conduct tests with facility in operation.

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- a. Measure resistance between PBB and electrical service intersystem termination point. Maximum acceptable value is 100 m Ω .
 - 1) If measured resistance from electrical service equipment to ground exceeds 5 Ω , notify Architect and include recommendations to reduce resistance to ground.
 - b. Measure resistance between SBBs and PBB. Maximum acceptable value is 100 m Ω .
 - 3. Test for ground loop currents using digital clamp-on ammeter, with full scale not more than 10 A, displaying current in increments of 0.01 A at accuracy of plus or minus 2.0 percent.
 - a. With grounding infrastructure completed and communications system electronics operating, measure current in bonding conductors connected to PBB. Maximum acceptable AC current level is 1 A.
 - C. Nonconforming Work:
 - 1. Communications bonding will be considered defective if it does not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
 - D. Collect, assemble, and submit test and inspection reports.
- 3.8 PROTECTION
- A. After installation, protect busbars and conductors from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 27 05 26

SECTION 27 05 28
PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL**1.1 SUMMARY****A. Section Includes:**

1. Type OFR and Type CR communications raceways and fittings.
2. Cable supports and positioning devices.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" specifies firestopping for communications pathways installed by this Section.
2. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding conductors and connectors for communications pathways installed by this Section.
3. Section 260529 "Hangers and Supports for Electrical Systems" specifies hangers and supports for communications pathways installed by this Section.
4. Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling" specifies sleeves and sleeve seals for communications pathways installed by this Section.
5. Section 260553 "Identification for Electrical Systems" specifies labels and warning signs for communications pathways installed by this Section.

1.2 ACTION SUBMITTALS**A. Product Data:**

1. For each type of product.
 - a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.

- 1) If listed manufacturer differs from selling manufacture, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
- 2) Listing criteria identified in approval letter must match specified listing criteria. Approval of only equipment's enclosure is not considered approval of equipment for intended application.
- 3) Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for similar products are not acceptable.

B. Samples:

1. Type OFR and Type CR Raceways: For each color and texture specified, 12 inch long.

1.3 INFORMATIONAL SUBMITTALS

- A. Manufacturers' published instructions submittals.**

PART 2 - PRODUCTS

2.1 TYPE OFR AND TYPE CR COMMUNICATIONS RACEWAYS AND FITTINGS

- A. Description:** This product group covers raceways and fittings for installation of conductive and nonconductive optical-fiber cable, communications cable, power-limited fire-alarm cable, signaling cable, and coaxial cable in accordance with CEC.
- B. Performance Criteria:**
1. Regulatory Requirements: Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
 2. Listing Criteria:
 - a. Optical-Fiber Cable Raceway: UL CCN QAZM; including UL 2024.
 - b. Communications Cable Raceway: UL CCN QBAA; including UL 2024.
- C. UL QAZM - Type OFR-P Plenum Optical-Fiber Raceway:**
1. Source Limitations: Obtain products from single manufacturer.
 2. Product Characteristics:
 - a. Meets UL 2024 test requirements for "PLENUM" marking.
 - b. Texture: Ribbed.
 - c. Splicing: Fusion.

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- 3. Required Product Options:
 - a. Colors:
 - 1) For Optical Fiber: Orange]

2.2 CABLE SUPPORTS AND POSITIONING DEVICES

- A. Description: This category covers straps, hooks, and similar types of hardware for installation and use in communications cabling systems in accordance with CEC and manufacturer's installation instructions
- B. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
- C. UL DWMU - J-Hook or G-Hook Cable Support:
 - 1. Source Limitations: Obtain products from single manufacturer.
 - 2. Product Listing Criteria: UL CCN DWMU; including UL 2239 or UL 1565.
 - 3. Product Characteristics:
 - a. Material: Galvanized steel.
- D. UL DWMU - Conduit or Cable Support Strap:
 - 1. Source Limitations: Obtain products from single manufacturer.
 - 2. Product Listing Criteria: UL CCN DWMU; including UL 2239 or UL 1565.
 - 3. Product Characteristics:
 - a. Mounting Orientation: Vertical.
 - 4. Required Product Options:
 - a. Suitable for use in air handling space.

PART 3 - EXECUTION

3.1 SELECTION OF PATHWAYS FOR COMMUNICATIONS SYSTEMS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with CEC for selection of duct raceways. Consult Architect for resolution of conflicting requirements.

- B. Type OFR and Type CR Communications Raceways: Comply with Table 800.154(b) of CEC.
- C. Minimum Pathway Size:
 - 1. For Copper and Aluminum Cables: Metric designator 21 (trade size 3/4).
 - 2. For Optical-Fiber Cables: Metric designator 25 (trade size 1).
- D. Maximum Pathway Length Between Cable Access Points: 75 ft.
- E. Temperature Limitations:
 - 1. Type PVC, Type HDPE, Type EPEC, Type OFR, and Type CR: Do not install where ambient temperature exceeds 122 deg F. Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
 - 2. Type RTRC: Do not install where ambient temperature exceeds 230 deg F.
- F. Outdoor Pathways:
 - 1. Exposed and Subject to Severe Physical Damage: IMC.
 - 2. Exposed and Subject to Physical Damage: IMC.
 - a. Locations less than 2.5 m (8 ft) above finished floor.
 - 3. Exposed and Not Subject to Physical Damage: Corrosion-resistant EMT.
 - 4. Concealed Aboveground: EMT.
 - 5. Innerducts inside Other Raceway: ENT.
- G. Indoor Pathways:
 - 1. Concealed above Suspended Ceilings: Hooks.
 - 2. Concealed in Ceilings and Interior Walls and Partitions: EMT
 - 3. Innerducts inside Metal Raceway: ENT.
- H. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
 - 1. ERMIC and IMC: Provide threaded-type fittings unless otherwise indicated.
- I. Surface Raceways: Where indicated on Drawings.
- J. Cable Supports and Positioning Devices:
 - 1. Size hooks to allow minimum of 25 percent future capacity without exceeding design capacity limits.
 - 2. Support hooks directly from building structure. Do not use ceiling grid support rods or wires.

3. Hook spacing must allow no more than 6 inch of slack. Lowest point of cables must be no closer than 6 inch to ceiling tiles, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
4. Space hooks no more than 5 ft on center.
5. Provide hook at each change in direction.

3.2 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

- A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:
 1. Fire-protection and fire-alarm equipment, including raceways, must be finished, painted, or suitably marked safety red.
- B. Pipe and Conduit Labeling: Comply with ASME A13.1 and IEEE C2.
- C. Color Coding Scheme for Communications Cable and Terminations: Comply with BICSI N1 and TIA-598.
- D. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:
 1. "COMMUNICATIONS."
 2. "FIRE ALARM."
 3. "SECURITY."
 4. "POWER".
- E. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- F. Locations of Underground Lines: Underground-line warning tape for communication, control wiring, and optical-fiber cable.
- G. Communications Vaults, Manholes, Handholes, and Pull and Junction Boxes: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels to identify phase.
 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
- H. Equipment and Cabling Identification for Administrative Records and Labeling: Comply with TIA-606 requirements for Class 3 network administration.
- I. Equipment Identification Labels:

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1. Black letters on white field.
2. Indoor Equipment: Self-adhesive label .
3. Outdoor Equipment: Laminated acrylic or melamine sign.
4. Equipment To Be Labeled:
 - a. Racks, Frames, and Enclosures: Identify front and rear of each enclosure with self-adhesive labels.
 - b. Patch Panels: Label individual rows in each rack, starting at top and working down, with self-adhesive labels.
 - c. Communications cabinets.
 - d. Access doors and panels for concealed communications items.
 - e. Emergency system boxes and enclosures.
 - f. Monitoring and control equipment.
 - g. Security equipment.
 - h. Life-safety communications equipment.
- J. Backbone Cables: Label each cable with a vinyl-wraparound label self-adhesive wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.
- K. Horizontal Cables: Label each cable with a vinyl-wraparound label.
- L. Cover Plates: Label individual cover plates with self-adhesive labels. Place label at top of cover plate. Identify cover plate in accordance with TIA-606.
- M. Cable Ties: General purpose, for attaching tags, except as listed below:
 1. Outdoors: UV-stabilized nylon.
 2. In Spaces Handling Environmental Air: Plenum rated.

3.3 SELECTION OF SIGNS AND HAZARD MARKINGS

- A. Comply with 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs.
- B. Signs, labels, and tags required for personnel safety must comply with the following standards:
 1. Safety Colors: NEMA Z535.1.
 2. Facility Safety Signs: NEMA Z535.2.
 3. Safety Symbols: NEMA Z535.3.
 4. Product Safety Signs and Labels: NEMA Z535.4.
 5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.
- C. Electrical Hazard Warnings:

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1. Multiple Power Sources Warning Legend: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT/RACK HAS MULTIPLE POWER SOURCES."

D. Operating Instruction Signs: Self-adhesive labels.

3.4 INSTALLATION OF PATHWAYS FOR COMMUNICATIONS SYSTEMS

- A. Comply with manufacturers' published instructions, including limitations on distance, bends, and bend radius.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Type OFR Optical-Fiber Raceways: Article 800 of CEC and BICSI N1.
2. Type CR Communications Raceways: Article 800 of CEC and BICSI N1.
3. Cable Supports and Positioning Devices: Article 800 of CEC and BICSI N1.
4. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Complete communications raceway installation before starting conductor installation.
2. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.
3. Provide hangers and supports for pathways, boxes, and enclosures.
4. Firestop pathway penetrations of fire-rated assemblies.
5. Identification:
 - a. Provide colors and labels for pathways, boxes, enclosures, and associated communications equipment.
 - b. Provide safety warning signs.

D. Interfaces with Other Work:

1. Coordinate installation of new communications pathways with existing conditions.
2. Grounding and Bonding: Bond metallic communications boxes and enclosures to metallic pathways. Coordinate with Section 271100 "Communications Equipment Room Fittings" for grounding and bonding of communications pathways to communications equipment room fittings.

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3.5 PROTECTION

- A. Protect coatings and finishes of pathways, boxes, and enclosures from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 27 05 28

SECTION 27 05 29**HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Steel slotted support systems.
2. Aluminum slotted support systems.
3. Nonmetallic slotted support systems.
4. Conduit and cable support devices.
5. Support for conductors in vertical conduit.
6. Structural steel for fabricated supports and restraints.
7. Mounting, anchoring, and attachment components.
8. Fabricated metal equipment support assemblies.

B. Related Requirements:

1. Section 270548 "Seismic Controls for Communications Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Slotted support systems, hardware, and accessories.
 - b. Clamps.
 - c. Hangers.
 - d. Sockets.
 - e. Eye nuts.
 - f. Fasteners.
 - g. Anchors.
 - h. Saddles.
 - i. Brackets.
2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for communications hangers and support systems.**HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTI****27 05 29 - 1****DEHESA SCHOOL MODERNIZATION**

1. Trapeze hangers. Include product data for components.
2. Steel slotted-channel systems.
3. Aluminum slotted-channel systems.
4. Nonmetallic slotted-channel systems.
5. Equipment supports.
6. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated Design Submittals: For hangers and supports for communications systems.

1. Include design calculations and details of trapeze hangers.
2. Include design calculations for seismic restraints.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Ductwork, piping, fittings, and supports.
3. Structural members to which hangers and supports will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:
 - a. Luminaires.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Projectors.

B. Seismic Qualification Data: Certificates, for hangers and supports for communications equipment and systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Welding certificates.

1.4 QUALITY ASSURANCE**A. Welding Qualifications:**

1. Qualify procedures and personnel according to AWS D1.1/D1.1M.
2. Qualify procedures and personnel according to the following:
 - a. AWS D1.1/D1.1M.
 - b. AWS D1.2/D1.2M.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.
- B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
 2. Component Importance Factor: 1.5.
- C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame Rating: Class 1.
 2. Self-extinguishing according to ASTM D635.

2.2 STEEL SLOTTED SUPPORT SYSTEMS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch- diameter holes at a maximum of 8 inches o.c. in at least one surface.
 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 2. Material for Channel, Fittings, and Accessories: Galvanized steel.
 3. Channel Width: 1-5/8 inches.
 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

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7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
8. Channel Dimensions: Selected for applicable load criteria.

2.3 ALUMINUM SLOTTED SUPPORT SYSTEMS

- A. Aluminum Slotted Support Systems: Extruded aluminum channels and angles with minimum 13/32-inch- diameter holes at a maximum of 8 inches o.c. in at least one surface.
 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 2. Channel Material: 6063-T6 aluminum alloy.
 3. Fittings and Accessories Material: 5052-H32 aluminum alloy.
 4. Channel Width: 1-5/8 inches.
 5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
 8. Channel Dimensions: Selected for applicable load criteria.

2.4 NONMETALLIC SLOTTED SUPPORT SYSTEMS

- A. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch- diameter holes at a maximum of 8 inches o.c., in at least one surface.
 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 2. Channel Width: 1-5/8 inches.
 3. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
 4. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
 5. Rated Strength: Selected to suit applicable load criteria.
 6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.5 CONDUIT AND CABLE SUPPORT DEVICES

- A. Conduit and Cable Support Devices: Steel clamps, hangers, and associated fittings, designed for types and sizes of raceway or cable to be supported.

2.6 SUPPORT FOR CONDUCTORS IN VERTICAL CONDUIT

- A. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored communications conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

2.7 STRUCTURAL STEEL FOR FABRICATED SUPPORTS AND RESTRAINTS

- A. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

2.8 MOUNTING, ANCHORING, AND ATTACHMENT COMPONENTS

- A. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.9 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION**3.1 APPLICATION**

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 - 1. NECA 1.
 - 2. NECA/BICSI 568.
 - 3. TIA-569-D.
 - 4. NECA 101.
 - 5. NECA 102.
 - 6. NECA 105.
 - 7. NECA 111.
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by CEC. Minimum rod size shall be ¼ inch in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with single-bolt conduit clamps, using spring friction action for retention in support channel.
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 INSTALLATION OF SUPPORTS

- A. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, according to CEC.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified

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loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten communications items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To Wood: Fasten with lag screws or through bolts.
 2. To New Concrete: Bolt to concrete inserts.
 3. To Masonry: Use approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Use expansion anchor fasteners.
 5. Instead of expansion anchors, powder-actuated-driven threaded studs, provided with lock washers and nuts, may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
 7. To Light Steel: Sheet metal screws.
 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor communications materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

- A. Touchup:
1. Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

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SPECIFICATIONS**NO. XXXX-XXXX-XX**

- a. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- 2. Comply with requirements in Section 099113 "Exterior Painting" Section 099123 "Interior Painting" and Section 099600 "High-Performance Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 27 05 29

SECTION 27 05 53
IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL**1.1 SUMMARY****A. Section Includes:**

1. Labels.
2. Bands and tubes.
3. Underground-line warning tape.
4. Signs.
5. Cable ties.
6. Miscellaneous identification products.

1.2 ACTION SUBMITTALS**A. Product Data:**

1. Labels.
2. Bands and tubes.
3. Underground-line warning tape.
4. Signs.
5. Cable ties.
6. Miscellaneous identification products.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for communications identification products.

C. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.**D. Identification Schedule:**

1. Outlets: Scaled drawings indicating location and proposed designation.
2. Backbone Cabling: Riser diagram showing each communications room, backbone cable, and proposed backbone cable designation.
3. Racks: Scaled drawings indicating location and proposed designation.
4. Patch Panels: Enlarged scaled drawings showing rack row, number, and proposed designations.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Comply with CEC and TIA 606-B.
- B. Comply with ANSI Z535.4 for safety signs and labels.
- C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Equipment Identification Labels:
 - 1. Black letters on a white field.

2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
- B. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
 - 1. Minimum Nominal Size:
 - a. 1-1/2 by 6 inches for raceway and conductors
 - b. 3-1/2 by 5 inches for equipment.
 - c. As required by authorities having jurisdiction.

2.4 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F According to ASTM D638: 12,000 psi.

IDENTIFICATION FOR COMMUNICATIONS SYSTEMS**27 05 53 - 2****DEHESA SCHOOL MODERNIZATION**

3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black, except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F According to ASTM D638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F According to ASTM D638: 7000 psi.
 3. UL 94 Flame Rating: 94V-0.
 4. Temperature Range: Minus 50 to plus 284 deg F.
 5. Color: Black.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

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DEHESA SCHOOL MODERNIZATION

- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.
- G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- H. Vinyl Wraparound Labels:
 - 1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
 - 3. Provide label 6 inches from cable end.
- I. Self-Adhesive Wraparound Labels:
 - 1. Secure tight to surface at a location with high visibility and accessibility.
 - 2. Provide label 6 inches from cable end.
- J. Self-Adhesive Labels:
 - 1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
- K. Cable Ties: General purpose, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

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DEHESA SCHOOL MODERNIZATION

- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.
- C. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box with self-adhesive labels containing wiring system legend.
 - 1. System legends shall be as follows:
 - a. Telecommunications.
- D. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate shall be labeled with its individual, sequential designation, composed of the following, in the order listed:
 - 1. Wiring closet designation.
 - 2. Colon.
 - 3. Faceplate number.
- E. Equipment Room Labeling:
 - 1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels.
 - 2. Patch Panels: Label individual rows in each rack, starting at top and working down, with self-adhesive labels.
 - 3. Data Outlets: Label each outlet with a self-adhesive label indicating the following, in the order listed:
 - a. Room number being served.
 - b. Colon.
 - c. Faceplate number.
- F. Backbone Cables: Label each cable with a vinyl-wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.
- G. Horizontal Cables: Label each cable with a vinyl-wraparound label indicating the following, in the order listed:
 - 1. Room number.
 - 2. Colon.
 - 3. Faceplate number.
- H. Instructional Signs: Self-adhesive labels.
- I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures: Self-adhesive labels.
 - 1. Apply to exterior of door, cover, or other access.

IDENTIFICATION FOR COMMUNICATIONS SYSTEMS**27 05 53 - 5****DEHESA SCHOOL MODERNIZATION**

J. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label.
2. Outdoor Equipment: Laminated-acrylic or melamine-plastic sign.
3. Equipment to Be Labeled:
 - a. Communications cabinets.
 - b. Uninterruptible power supplies.
 - c. Computer room air conditioners.
 - d. Fire-alarm and suppression equipment.
 - e. Egress points.
 - f. Power distribution components.

END OF SECTION 27 05 53

SECTION 27 11 00
COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL**1.1 SUMMARY****A. Section Includes:**

1. Communications-circuit accessories.

B. Products Installed, but Not Furnished, under This Section:

1. Section 061000 "Rough Carpentry" furnishes equipment backing panels installed by this Section.
2. Section 260526 "Grounding and Bonding for Electrical Systems" furnishes the following installed by this Section:
 - a. Grounding and bonding conductors.
 - b. Grounding and bonding clamps.
 - c. Grounding and bonding bushings.
 - d. Grounding and bonding hubs.
 - e. Grounding and bonding connectors.
 - f. Intersystem bonding bridge grounding connector.
 - g. Grounding and bonding busbars.
 - h. Signal reference grids.
3. Section 260529 "Hangers and Supports for Electrical Systems" furnishes hangers, supports, and concrete bases for communications equipment installed by this Section.
4. Section 260533 "Raceway and Boxes for Electrical Systems" furnishes the following installed by this Section:
 - a. Metallic outlet boxes, device boxes, rings, and covers.
 - b. Junction boxes and pull boxes.
 - c. Cover plates for device boxes.
5. Section 260553 "Identification for Electrical Systems" furnishes labels and warning signs for communications pathways installed by this Section.
6. Section 262726 "Wiring Devices" furnishes duplex receptacles installed by this Section.

C. Related Requirements:

1. Section 013100 "Project Management and Coordination" for preinstallation conference procedures.
2. Section 270528 "Pathways for Communications Systems" for installation of cable pathways serving communications equipment room fittings installed under this Section.

1.2 DEFINITIONS

A. Abbreviations for Communications Spaces:

1. EF: Entrance facility; generally serves campus or building. EF may include an ER.
2. ER: Equipment room; generally serves campus or building.
3. TE: Telecommunications enclosure; generally serves a single tenant or floor.
4. TR: Telecommunications room; generally serves a single tenant or floor.

B. Abbreviations for Communications Facilities:

1. HC: Horizontal cross-connect; also called "floor distributor" (FD).
2. IC: Intermediate cross-connect; also called "building distributor" (BD).
3. MC: Main cross-connect; also called "campus distributor" (CD).

C. Abbreviations for Grounding and Bonding:

1. BBC: Backbone bonding conductor, for connecting multiple TBBs serving the same floor.
2. PBB: Primary bonding busbar; located in main distribution frame room, ideally near electrical service entrance.
3. RBB: Rack bonding busbar; located in equipment cabinets and racks.
4. SBB: Secondary bonding busbar; located in intermediate distribution frame rooms.
5. TBB: Telecommunications bonding backbone, for connecting SBBs to PBB.
6. TBC: Telecommunications bonding conductor, for connecting PBB to intersystem bonding termination device or busbar at electrical service entrance.
7. TEBC: Telecommunications equipment bonding conductor, for connecting RBBs to SBBs or PBB.
8. UBC: Unit bonding conductor, for connecting individual communications equipment to RBBs or SBBs.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
- B. Preinstallation Coordination Meeting(s): For communications equipment room planning. Conduct meeting(s) as videoconference or at Project site prior to installation.

COMMUNICATIONS EQUIPMENT ROOMS FITTINGS

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DEHESA SCHOOL MODERNIZATION

1. Attendees: Representative of Owner's information and communications technology staff, installers, fabricators, representatives of manufacturers, and administrators for field tests and inspections. Notify Architect of scheduled meeting dates.

1.4 ACTION SUBMITTALS

A. Shop Drawings:

1. Communications equipment room drawings, diagrams, and supporting documents.

PART 2 - PRODUCTS

2.1 COMMUNICATIONS-CIRCUIT ACCESSORIES

- ##### A. Description: This category covers devices intended for connecting communications circuits in accordance with Article 800 of CEC.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria:
 - a. For Communications Circuits: UL CCN DUXR; including UL 1863 and UL 467.
 - b. For Audio/Video, Data, and Signaling Circuits: UL CCN DUXR; including UL 1977 and UL 467.

C. UL DUXR - 66-Style or 110-Style Cross-Connect Frame:

1. Source Limitations: Obtain products from single manufacturer.
2. Description: This product type includes the frame only. Block inserts and related termination equipment are specified in communications cabling Sections.

D. UL DUXR - Patch Panel:

1. Source Limitations: Obtain products from single manufacturer.
2. Product Characteristics:
 - a. Mounting: Equipment rack.
 - b. Style: Modular.
 - c. EMI Compatibility: Unshielded.
 - d. Configuration: Standard; flat.
 - e. Include provisions for labeling ports.

COMMUNICATIONS EQUIPMENT ROOMS FITTINGS

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DEHESA SCHOOL MODERNIZATION

3. Required Product Options:
 - a. Distribution Port Quantity: 24
 - b. Cable Type: Cat. 6.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Shop Drawings: Prepare and submit the following:
 1. Communications Equipment Room Drawings, Diagrams, and Supporting Documents:
 - a. Include plans, elevations, sections, details, and attachments to other work.
 - b. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - c. Equipment Racks and Cabinets: Indicate workspace requirements and access for cable connections.
 - d. Switchboards, Panelboards, and Safety Switches: Indicate workspace requirements and access for cable connections.
 - e. Grounding and Bonding: Indicate location of busbars and their mounting details showing standoff insulators and wall mounting brackets.
 - f. Cable Trays, Large Raceways, Ducts, and Piping: Indicate elevation and route of vertical and horizontal cable trays, raceways or ducts larger than 2 inch wide, and fire-suppression piping located inside communications equipment room.
 - g. Luminaires: Indicate elevation, orientation, and size of luminaires inside the communications equipment room for coordination with cable trays, equipment racks, cabinets, and other equipment.
 - h. Access Panels: Indicate locations, dimensions, and clearances required to open access panels in ducts, walls, or ceilings inside communications equipment room.
 - i. Controls: Indicate locations of sensors, switches, and push-buttons for HVAC, fire suppression, fire alarm, and standby power.
 - j. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize configurations and space requirements of communications equipment.
 - k. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.
 - l. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

COMMUNICATIONS EQUIPMENT ROOMS FITTINGS

27 11 00 - 4

DEHESA SCHOOL MODERNIZATION

- B. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.

3.2 FIELD-FABRICATION OF FITTINGS FOR ENTRANCE FACILITY

- A. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
 - 1. Designated Critical Operations Areas: Comply with Article 708 of CEC .
 - 2. Communications Systems: Comply with Ch. 8 of CEC and with BICSI N1.
 - 3. Grounding and Bonding: Comply with Article 250 of CEC and with BICSI N3.
 - 4. Consult Architect for resolution of conflicting requirements.
- B. Provide the following specified products in entrance facility room or space:
 - 1. One PBB.
 - 2. Quantity as indicated on Drawings of 66-style or 110-style cross-connect frame.
 - 3. Quantity as indicated on Drawings of patch panel.

3.3 FIELD-FABRICATION OF FITTINGS FOR TELECOMMUNICATIONS ROOMS

- A. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
 - 1. Designated Critical Operations Areas: Comply with Article 708 of CEC.
 - 2. Communications Systems: Comply with Ch. 8 of CEC and with BICSI N1.
 - 3. Grounding and Bonding: Comply with Article 250 of CEC and with BICSI N3.
 - 4. Consult Architect for resolution of conflicting requirements.
- B. Provide the following specified products in intermediate distribution frame room or space:
 - 1. Quantity as indicated on Drawings of equipment backing panel.
 - a. Install from 6 inch to 8 ft, 6 inch above finished floor. If plywood is fire treated, ensure that fire-treatment stamp is visible after installation.
 - 2. One SBB.
 - 3. Quantity as indicated on Drawings of duplex straight-blade receptacle, outlet box, and cover plate.
 - 4. One 19 inch enclosed equipment rack with RBB and enclosure-mounted relocatable power tap.
 - 5. Quantity as indicated on Drawings of patch panel.

COMMUNICATIONS EQUIPMENT ROOMS FITTINGS

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DEHESA SCHOOL MODERNIZATION

3.4 INSTALLATION OF BONDING FOR COMMUNICATIONS

- A. Grounding of Communications: Bond PBB and SBBs to grounding electrode conductors at electrical power service entrance, and at electrical power derived systems serving communications equipment, using intersystem bonding termination device.
 - 1. Structural Steel: Where structural steel of steel frame building is readily accessible within room or space, bond each SBB and PBB to vertical steel of building frame.
- B. Comply with manufacturer's published instructions.
- C. Reference Standards:
 - 1. Bonding of Communications: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with BICSI N3.
 - 2. Consult Architect for resolution of conflicting requirements.
- D. Special Techniques:
 - 1. Bonding of Busbars:
 - a. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 12 inch above finished floor unless otherwise indicated.
 - b. Where busbars are indicated on both sides of doorways, route bonding conductor up to top of door frame, across top of doorway, and down; connect to continuation of horizontal busbar.
 - 2. Bonding Conductors:
 - a. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
 - b. Assemble wire connector to conductor, complying with manufacturer's published instructions and as follows:
 - 1) Use crimping tool and die specific to connector.
 - 2) Pretwist conductor.
 - 3) Apply antioxidant compound to bolted and compression connections.
 - c. Install in straightest and shortest route between origination and termination point, and no longer than required. Bend radius must not be smaller than 10 times diameter of conductor. No single bend may exceed 90 degrees.
 - d. Install without splices.
 - e. Support conductors at not more than 36 inch intervals.

COMMUNICATIONS EQUIPMENT ROOMS FITTINGS**27 11 00 - 6****DEHESA SCHOOL MODERNIZATION**

- f. Outside telecommunications rooms, install conductors in metric designator 21 (trade size 3/4) PVC-80 conduit until conduit enters telecommunications room. Install bonding conductors in EMT-A or EMT-SS when routed through plenum. Do not install bonding conductors in EMT-S unless otherwise indicated on Drawings.
 - 1) If bonding conductor must be installed in EMT-S or other ferrous metallic raceway, bond conductor to raceway using grounding bushing and bond both ends of raceway to SBB.
3. Provide TBC and terminate ends to PBB and intersystem bonding termination device busbar at electrical service entrance in accordance with Section 250.94, "Bonding for Communication Systems," of CEC.
4. Busbar Interconnections: Bond SBBs to PBB with TBBs. If more than one TBB is installed, bond TBBs together with BBCs where required by TIA-607.
5. Communications Enclosures: Bond metallic enclosures of telecommunications equipment with UBCs to nearest SBB or PBB.
6. Equipment Racks: Bond metallic components of enclosures to RBB using UBCs. Provide horizontally mounted RBB if not provided by enclosure or rack manufacturer. Bond RBB to SBB with TEBC. Power connection must comply with CEC; equipment grounding conductor in power cord of cord- and plug-connected equipment must be considered supplemental to bonding requirements in this Section.
7. Shielded Cable: Bond shield of shielded cable to SBB in communications rooms and spaces. Comply with TIA-568.1 and TIA-568.2 when grounding shielded balanced twisted-pair cables.
8. Primary Protector: Bond to PBB with insulated bonding conductor.
9. Electrical Power Panelboards: Where electrical panelboards for communications equipment are located in same room or space, bond each ground bar of panelboard to SBB.
10. Ladder Racks: Provide continuous electrical path by installing bonding clips and jumpers. Bond each end to nearest SBB.
11. Access Floors: Bond metal parts of access floors to SBB.

3.5 FIELD QUALITY CONTROL FOR BONDING OF COMMUNICATIONS

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:
 1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench according to manufacturer's published instructions.
 2. Test bonding connections of system using AC earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing PBB or SBB, using process recommended by BICSI N1. Conduct tests with facility in operation.

COMMUNICATIONS EQUIPMENT ROOMS FITTINGS

27 11 00 - 7

DEHESA SCHOOL MODERNIZATION

- a. Measure resistance between PBB and electrical service intersystem termination point. Maximum acceptable value is 100 mΩ.
 - 1) If measured resistance from electrical service equipment to ground exceeds 5 Ω, notify Architect and include recommendations to reduce resistance to ground.
 - b. Measure resistance between SBBs and PBB. Maximum acceptable value is 100 mΩ.
 - 3. Test for ground loop currents using digital clamp-on ammeter, with full scale not more than 10 A, displaying current in increments of 0.01 A at accuracy of plus or minus 2.0 percent.
 - a. With grounding infrastructure completed and communications system electronics operating, measure current in bonding conductors connected to PBB. Maximum acceptable AC current level is 1 A.
 - C. Nonconforming Work:
 - 1. Communications bonding will be considered defective if it does not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
 - D. Collect, assemble, and submit test and inspection reports.
- 3.6 PROTECTION
- A. After installation, protect communications equipment room fittings from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 27 11 00

SECTION 27 11 16
COMMUNICATIONS RACKS, FRAMES, AND ENCLOSURES

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. 19-inch wall-mounted equipment cabinets.
 - 2. Power strips.
 - 3. Grounding.
 - 4. Labeling.
- B. Related Requirements:
 - 1. Section 271100 "Communications Equipment Room Fittings" for backboards and accessories.
 - 2. Section 270526 "Grounding and Bonding for Telecommunications Equipment" for TMGBs and TGBs.
 - 3. Section 271323 "Communications Optical Fiber Backbone Cabling" for optical-fiber data cabling associated with system panels and devices.
 - 4. Section 271513 "Communications Copper Horizontal Cabling" for copper data cabling associated with system panels and devices.

1.3 DEFINITIONS

- A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.
- B. BICSI: Building Industry Consulting Service International.
- C. LAN: Local area network.
- D. RCDD: Registered communications distribution designer.
- E. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

- F. TGB: Telecommunications grounding bus bar.
- G. TMGB: Telecommunications main grounding bus bar.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, certifications, standards compliance, and furnished specialties and accessories.
- B. Shop Drawings: For communications racks, frames, and enclosures. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
 - 3. Grounding: Indicate location of TGB and its mounting detail showing standoff insulators and wall-mounting brackets.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.
- B. Seismic Qualification Data: Certificates, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under direct supervision of RCDD.
2. Installation Supervision: Installation shall be under direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as RCDD to perform on-site inspection.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified."
- B. UL listed.
- C. RoHS compliant.
- D. Compliant with requirements of the Payment Card Industry Data Security Standard.

2.2 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels specified in Section 061000 "Rough Carpentry."

2.3 19-INCH EQUIPMENT CABINETS

- A. Description: Manufacturer-assembled four-post frame enclosed by side and top panels and front and rear doors, designed for mounting telecommunications equipment. Width is compatible with EIA/ECIA 310-E, 19-inch equipment mounting with an opening of 17.72 inches between rails.
- B. General Cabinet Requirements:
 1. Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
- C. Cable Management:
 1. ABS, with integral retaining fingers.

COMMUNICATIONS RACKS, FRAMES, AND ENCLOSURE**27 11 16 - 3****DEHESA SCHOOL MODERNIZATION**

2. Provide horizontal crossover cable manager at top of each relay rack, with a minimum height of two rack units each.

2.4 POWER STRIPS

A. Power Strips: Comply with UL 1363.

1. Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
2. Rack mounting.
3. Six15-A, 120-V ac, NEMA WD 6, Configuration 5-15R receptacles.
4. LED indicator lights for power and protection status.
5. LED indicator lights for reverse polarity and open outlet ground.
6. Circuit Breaker and Thermal Fusing: When protection is lost, circuit opens and cannot be reset.
7. Circuit Breaker and Thermal Fusing: Unit continues to supply power if protection is lost.
8. Cord connected with 15-foot line cord.
9. Rocker-type on-off switch, illuminated when in on position.
10. Peak Single-Impulse Surge Current Rating: 33 kA per phase.
11. Protection modes shall be line to neutral, line to ground, and neutral to ground. UL 1449 clamping voltage for all three modes shall be not more than 330 V.

2.5 GROUNDING

- A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.
- B. Rack and Cabinet TGBs: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-606-B. Predrilling shall be with holes for use with lugs specified in this Section.
 1. Cabinet-Mounted TGB: Terminal block, with stainless-steel or copper-plated hardware for attachment to cabinet.
 2. Rack-Mounted Horizontal TGB: Designed for mounting in 19-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.

2.6 LABELING

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Comply with NECA 1.
- B. Comply with BICSI TDMM for layout of communications equipment spaces.
- C. Comply with BICSI ITSIMM for installation of communications equipment spaces.
- D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- E. Coordinate layout and installation of communications equipment in racks and room. Coordinate service entrance configuration with service provider.
 - 1. Meet jointly with system providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
 - 2. Record agreements reached in meetings and distribute them to other participants.
 - 3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment spaces to accommodate and optimize configuration and space requirements of telecommunications equipment.
 - 4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.
- F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.2 GROUNDING

- A. Comply with NECA/BICSI 607.
- B. Install grounding according to BICSI ITSIMM, "Bonding, Grounding (Earthing) and Electrical Protection" Ch.
- C. Locate TGB to minimize length of bonding conductors. Fasten to wall, allowing at least 2 inches of clearance behind TGB. Connect TGB with a minimum No. 4 AWG grounding electrode conductor from TGB to suitable electrical building ground. Connect rack TGB to near TGB or the TMGB.
 - 1. Bond the shield of shielded cable to patch panel, and bond patch panel to TGB or TMGB.

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3.3 IDENTIFICATION

- A. Coordinate system components, wiring, and cabling complying with TIA-606-B. Comply with requirements in Section 270553 "Identification for Electrical Systems."
- B. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- C. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 3 level of administration.
- D. Labels shall be machine printed. Type shall be 3/16 inch in height.

END OF SECTION 27 11 16

SECTION 27 13 23
COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING

PART 1 - GENERAL**1.1 SUMMARY**

- A. Section Includes:
 - 1. Type OFCP optical fiber cable.
 - 2. Optical fiber cable hardware.

1.2 DEFINITIONS

- A. Conductive Cable: Cable containing non-current-carrying electrically-conductive members such as metallic strength members and metallic vapor barriers.
- B. Cross-Connect: A facility enabling termination of cable elements and their interconnection or cross-connection.
- C. Type OFCP: Conductive cable for use in plenums, ducts, and other spaces used for environmental air.

1.3 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.4 ACTION SUBMITTALS

- A. Product Data:
 - 1. Type OFCP optical fiber cable.
 - 2. Optical fiber cable hardware.
- B. Shop Drawings:
 - 1. System Labeling Schedules:
 - a. Electronic copy of labeling schedules, in software and format selected by Owner.
 - b. Electronic copy of labeling schedules that are part of cabling and asset identification system of software.
 - 2. Cabling administration drawings and printouts.
 - 3. Wiring diagrams showing typical schematic arrangement, including the following:

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- a. Telecommunications rooms plans and elevations.
 - b. Telecommunications pathways.
 - c. Telecommunications system access points.
 - d. Telecommunications grounding system.
 - e. Cross-connects.
 - f. Patch panels.
 - g. Patch cords.
 - 4. Cross-Connect and Patch-Panel Drawings: Detail mounting assemblies and show elevations and physical relationship between installed components.
 - C. Certificates: For each type of product.
 - D. Field Quality-Control Reports: Optical fiber cable testing plan.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Source quality-control reports.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Contracts:
 - 1. Software service agreement.
 - B. Maintenance Data: For optical fiber cable, splices, and connectors.
- 1.7 MAINTENANCE MATERIAL SUBMITTALS
- A. Extra Stock Material: Furnish to Owner extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Include the following:
 - 1. Patch-Panel Units: One of each type.
 - 2. Plugs: 10 of each type.
 - 3. Jacks: 10 of each type.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet-work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
 - B. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine continuity of strand end to end. Use optical fiber flashlight or optical loss test set.
2. Test optical fiber cable while on reels. Use optical time domain reflectometer to verify cable length and locate cable defects, splices, and connector, including loss value of each. Retain test data and include record in maintenance data.

PART 2 - PRODUCTS**2.1 TYPE OFCP OPTICAL FIBER CABLE**

- A. Type OFCP Optical Fiber Cable: This category covers jacketed optical fiber cable for use in vertical runs in plenums, ducts, or other spaces used for environmental air within buildings in accordance with Article 770 of CEC containing noncurrent-carrying electrically conductive materials.
- B. Performance Criteria:
 1. Regulatory Requirements: Listed and labeled in accordance with CEC, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 2. Listing Criteria: UL CCN QAYK; including UL 1651.
 3. General Characteristics:
 - a. Performance: TIA-568.3.
 - b. Inside Plant Mechanical Properties: ICEA S-83-596.
 - c. Inside-Outside Plant Mechanical Properties: ICEA S-104-696.
 - d. Jacket:
 - 1) Cable cordage jacket, fiber, unit, and group color in accordance with TIA-598.
 - 2) Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inch.
- C. Type OFCP, Designation OM4, Multimode Optical Fiber Cable:
 1. Source Limitations: Obtain products from single manufacturer.
 2. Additional Characteristics:
 - a. Construction: TIA-492AAAD; 850 nm laser-optimized, 50 µm core diameter, 125 µm cladding diameter.
 - b. Minimum Overfilled Modal Bandwidth-Length Product: 3500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.
 - c. Minimum Effective Modal Bandwidth-Length Product: 4700 MHz-km at 850 nm wavelength.
 3. Options:
 - a. Configuration: 12 fiber, tight buffer, optical fiber cable.

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- b. Maximum Attenuation: 3.50 dB/km at 850 nm wavelength; 1.5 dB/km at 1300 nm wavelength.
- c. Jacket Color: Aqua.
- d. Armor: Steel.

2.2 OPTICAL FIBER CABLE HARDWARE

A. Performance Criteria:

- 1. Fiber Optic Connector Intermateability Standard (FOCIS) specifications of TIA-604 series.
- 2. TIA-568.3.

B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

- 1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

C. Patch Cords: Factory-made, dual-fiber cables in 36 inch lengths.

D. Connector Type: Type SC complying with TIA-604-3, connectors.

E. Plugs and Plug Assemblies:

- 1. Male; color-coded modular telecommunications connector designed for termination of single optical fiber cable.
- 2. Insertion loss not more than 0.25 dB.

F. Jacks and Jack Assemblies:

- 1. Female; quick-connect, simplex and duplex; fixed telecommunications connector designed for termination of single optical fiber cable.
- 2. Insertion loss not more than 0.25 dB.
- 3. Marked to indicate transmission performance.
- 4. Designed to snap-in to patch panel or faceplate.

2.3 SOURCE QUALITY CONTROL

- A. Owner will witness required factory tests. Notify Architect at least 14 days before date of tests and indicate their approximate duration.
- B. Testing Administrator: Engage qualified testing agency to evaluate cables.

C. Factory Tests and Inspections:

1. Test and inspect multimode optical fiber cables, by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, in accordance with TIA-526-14 and TIA-568.3 before delivering to site. Affix label with name and date of manufacturer's certification of system compliance.
2. Test and inspect pre-terminated optical fiber cable assemblies, by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, in accordance with TIA-526-14 and TIA-568.3 before delivering to site. Affix label with name and date of manufacturer's certification of system compliance.

D. Nonconforming Work:

1. Cables that do not pass tests and inspections will be considered defective.

E. Prepare test and inspection reports.**PART 3 - EXECUTION****3.1 PREPARATION**

- A. Coordinate backbone cabling with protectors and demarcation point provided by communications service provider.

3.2 SELECTION OF OPTICAL FIBER TYPE

- A. Installed in Plenum, Duct, or Other Space Handling Environmental Air:

1. Conductive:
 - a. Type OFCP.
 - b. Type OFCP in metallic conduit.

3.3 INSTALLATION OF OPTICAL FIBER BACKBONE CABLES

- A. Optical fiber backbone cabling system must provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.
- B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters may not be used as part of backbone cabling.

- C. Comply with BICSI N1, NECA NEIS 1, and NECA NEIS 301.
- D. Backbone cabling system must comply with transmission standards in TIA-568.1.
- E. Telecommunications Pathways and Spaces: Comply with TIA-569.
- F. Wiring Methods:
 - 1. Not in Raceway: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
 - 2. In Raceway: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
 - a. Install plenum cable in environmental airspaces, including plenum ceilings.
 - b. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."
 - 3. In Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- G. Optical Fiber Cabling Installation:
 - 1. Comply with TIA-568.1 and TIA-568.3.
 - 2. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."
 - 3. Terminate all cables; no cable may contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inch and not more than 6 inch from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 6. Bundle, lace, and train cable to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
 - 7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 - 8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps may not be used for heating.
 - 9. In communications equipment room, provide 10 ft long service loop on each end of cable.
 - 10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

11. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

3.4 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569, Annex A, "Firestopping."
- C. Comply with BICSI ITSIMM, "Firestopping" Chapter.

3.5 GROUNDING

- A. Install grounding in accordance with BICSI ITSIMM, "Grounding (Earthing), Bonding, and Electrical Protection" Chapter.
- B. Comply with TIA-607 and NECA/BICSI-607.
- C. Locate grounding bus bar to minimize length of bonding conductors. Fasten to wall allowing at least 2 inch clearance behind grounding bus bar. Connect grounding bus bar with minimum 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to grounding bus bar, using not smaller than 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
 1. Administration Class: Class 3.
 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Paint and label colors for equipment identification must comply with TIA-606 for Class 3 level of administration.
- C. Comply with requirements in Section 271523 "Communications Optical Fiber Horizontal Cabling" for cable and asset management software.
- D. Cable Schedule: Install in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish electronic copy of final comprehensive schedules for Project.

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- E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- F. Cable and Wire Identification:
 - 1. Label each cable within 4 inch of each termination and tap, where it is accessible in cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 ft.
 - 4. Label each unit and field within distribution racks and frames.
 - 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use different color for jacks and plugs of each service.
- G. Labels must be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606, for the following:
 - 1. Flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:
 - 1. Visually inspect optical fiber jacket materials for qualified electrical testing laboratory certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Optical Fiber Cable Tests:
 - a. Test instruments must meet or exceed applicable requirements in TIA-568.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - b. Link End-to-End Attenuation Tests:

- 1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in one direction in accordance with TIA-526-14, Method B, One Reference Jumper.
- 2) Attenuation test results for backbone links must be less than 2.0 dB. Attenuation test results must be less than those calculated in accordance with equation in TIA-568.1.

C. Nonconforming Work:

1. Cables will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective cables and retest.

D. Collect, assemble, and submit test and inspection reports.

1. Data for each measurement must be documented.
2. Data for field quality-control report submittals must be printed in summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from instrument to computer, saved as text files, and printed and submitted.

E. Manufacturer Services:

1. Engage factory-authorized service representative to support field tests and inspections.

END OF SECTION 27 13 23

SECTION 27 15 13
COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL**1.1 SUMMARY**

- A. Section Includes:
1. Category 6 twisted pair cable.
 2. Cable management system.
 3. Identification products.

1.2 DEFINITIONS

- A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- B. EMI: Electromagnetic interference.
- C. FTP: Shielded twisted pair.
- D. F/FTP: Overall foil screened cable with foil screened twisted pair.
- E. F/UTP: Overall foil screened cable with unscreened twisted pair.
- F. IDC: Insulation displacement connector.
- G. Jack: Also commonly called an "outlet," it is the fixed, female connector.
- H. LAN: Local area network.
- I. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.
- J. RCDD: Registered Communications Distribution Designer.
- K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
- L. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
- M. S/FTP: Overall braid screened cable with foil screened twisted pair.
- N. S/UTP: Overall braid screened cable with unscreened twisted pairs.

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- O. UTP: Unscreened (unshielded) twisted pair.

1.3 COPPER HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cable cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C, and the equipment outlet, otherwise known as "Cabling Subsystem 1," in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.
 - 1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.
 - 2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
 - 3. Bridged taps and splices shall not be installed in the horizontal cabling.
- B. A work area is approximately 100 sq. ft., and includes the components that extend from the equipment outlets to the station equipment.
- C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

1.4 ACTION SUBMITTALS

- A. Product Data:
 - 1. Category 6 twisted pair cable.
 - 2. Cable management system.
 - 3. Identification products.
- B. Shop Drawings: Reviewed and stamped by RCDD.
 - 1. System Labeling Schedules:
 - a. Electronic copy of labeling schedules, in software and format selected by Owner.
 - b. Electronic copy of labeling schedules that are part of cabling and asset identification system of software.
 - 2. Cabling administration Drawings and printouts.
 - 3. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment, including the following:

- a. Telecommunications rooms plans and elevations.
 - b. Telecommunications pathways.
 - c. Telecommunications system access points.
 - d. Telecommunications grounding system.
 - e. Telecommunications conductor drop locations.
 - f. Typical telecommunications details.
- C. Twisted pair cable testing plan.
- D. Samples: For telecommunications jacks and plugs, in specified finish, one for each type and configuration and cover plates for color selection and evaluation of technical features.
- E. Field quality-control reports.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, installation supervisor, and field inspector.
- B. Product Certificates: For each type of product.
- C. Source quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For splices and connectors to include in maintenance manuals.
- B. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On USB media or compact disk, complete with data files.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

1.7 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. Connecting Blocks: One of each type.
 - 2. Cover Plates: One of each type.
 - 3. Jacks: Ten of each type.
 - 4. Patch-Panel Units: One of each type.
 - 5. Plugs: Ten of each type.

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1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
 - 1. Layout Responsibility: Preparation of Shop Drawings, cabling administration Drawings, and field testing program development by an RCDD.
 - 2. Installation Supervision: Installation shall be under the direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.
 - 3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test each pair of twisted pair cable for open and short circuits.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.11 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

- B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.
- C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and CEC for the following types:
 - 1. Communications, Plenum Rated:
 - a. Type CMP complying with UL 1685.
 - b. Type CMP in metallic conduit installed according to CEC, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- C. RoHS compliant.

2.3 CATEGORY 6 TWISTED PAIR CABLE

- A. Category 6 Twisted Pair Cable: Four-pair, balanced -twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250 MHz.
- B. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
- C. Conductors: 100-ohm, 23 AWG solid copper.
- D. Shielding/Screening: Unshielded twisted pairs (UTP)
- E. Cable Rating: Plenum.
- F. Jacket: Blue thermoplastic.

2.4 TWISTED PAIR CABLE HARDWARE

- A. Twisted Pair Cable Hardware: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.
- B. General Requirements for Twisted Pair Cable Hardware:

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DEHESA SCHOOL MODERNIZATION

1. Comply with the performance requirements of Category 6
 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
 3. Cables shall be terminated with connecting hardware of same category or higher.
- C. Source Limitations: Obtain twisted pair cable hardware from same manufacturer as twisted pair cable, from single source.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
1. Features:
 - a. Universal T568A and T568B wiring labels.
 - b. Labeling areas adjacent to conductors.
 - c. Replaceable connectors.
 - d. 24 ports.
 2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
 3. Number of Jacks per Field: One for each four-pair cable indicated.
- F. Patch Cords: Factory-made, four-pair cables in 36-inch lengths; terminated with an eight-position modular plug at each end.
1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
 2. Patch cords shall have color-coded boots for circuit identification.
- G. Plugs and Plug Assemblies:
1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
 2. Standard: Comply with TIA-568-C.2.
 3. Marked to indicate transmission performance.
- H. Jacks and Jack Assemblies:
1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
 2. Designed to snap-in to a patch panel or cover plate.

COMMUNICATIONS COPPER HORIZONTAL CABLING**27 15 13 - 6****DEHESA SCHOOL MODERNIZATION**

3. Standard: Comply with TIA-568-C.2.
4. Marked to indicate transmission performance.

I. Cover Plate:

1. Four port, vertical single gang cover plates designed to mount to single gang wall boxes.
2. Plastic Cover Plate: High-impact plastic. Coordinate color with Section 260533.16 "Boxes and Covers for Electrical Systems."
3. Metal Cover Plate: Stainless steel, complying with requirements in Section 260533.16 "Boxes and Covers for Electrical Systems."
4. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.
 - a. Flush mounting jacks, positioning the cord at a 45-degree angle.

J. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 CABLE MANAGEMENT SYSTEM

- A. Cable Management System: Computer-based cable management system, with integrated database capabilities.
- B. Document physical characteristics by recording the network, TIA details, and connections between equipment and cable.
- C. Information shall be presented in database view, schematic plans, or technical drawings.
 1. AutoCAD drawing software shall be used as drawing and schematic plans software.
- D. System shall interface with the following testing and recording devices:
 1. Direct upload tests from circuit testing instrument into the personal computer.
 2. Direct download circuit labeling into labeling printer.

2.6 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.7 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test cables on reels according to TIA-568-C.1.
- C. Factory test twisted pair cables according to TIA-568-C.2.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION**3.1 WIRING METHODS**

- A. Routing:
 - 1. Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables, except in unfinished spaces.
 - a. Install plenum cable in environmental air spaces, including plenum ceilings.
 - b. Comply with requirements for raceways and boxes specified in Section 270528 "Pathways for Communications Systems."
 - 2. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF PATHWAYS

- A. Comply with requirements for demarcation point, cabinets, and racks specified in Section 271100 "Communications Equipment Room Fittings."
- B. Comply with Section 270528 "Pathways for Communications Systems."
- C. Comply with Section 260529 "Hangers and Supports for Electrical Systems."
- D. Comply with Section 260536 "Cable Trays for Electrical Systems."

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- E. Drawings indicate general arrangement of pathways and fittings.

3.3 INSTALLATION OF TWISTED PAIR HORIZONTAL CABLES

- A. Comply with NECA 1 and NECA/BICSI 568.

- B. General Requirements for Cabling:

1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
2. Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM), Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. MUTOA shall not be used as a cross-connect point.
7. Consolidation points may be used only for making a direct connection to equipment outlets:
 - a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
 - b. Locate consolidation points for twisted pair cables at least 49 feet from communications equipment room.
8. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
9. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
10. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
11. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.
12. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
13. In the communications equipment room, install a 10-foot- long service loop on each end of cable.
14. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

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C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend twisted pair cabling, not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

E. Group connecting hardware for cables into separate logical fields.**F. Separation from EMI Sources:**

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

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5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with "Firestopping Systems" Article in BICSI's "Telecommunications Distribution Methods Manual."

3.5 GROUNDING

- A. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."
- C. Comply with TIA-607-B and NECA/BICSI-607.
- D. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.
- E. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
 1. Administration Class: Class 3.
 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 3 level of administration.

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- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- E. Cable and Wire Identification:
 - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
 - 4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
 - b. Label each unit and field within distribution racks and frames.
 - 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- F. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:
 - 1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:
 - 1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-

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- coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.
- D. Nonconforming Work:
1. End-to-end cabling will be considered defective if it does not pass tests and inspections.
 2. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- E. Collect, assemble, and submit test and inspection reports.
- F. Manufacturer Services:
1. Engage factory-authorized service representative to support field tests and inspections.

END OF SECTION 27 15 13

SECTION 27 41 16.51**INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT FOR CLASSROOMS****PART 1 - GENERAL****1.1 PROJECT SCOPE**

- A. This section covers the requirements for an Integrator to design, provide equipment for, and install instructional classroom technology. This is intended to supply a complete instructional technology classroom that can be arranged in multiple configurations. There will be a multimedia display as primary display. Flexibility, integration of multiple technologies and sources, and multiple user groupings are essential to this concept. As an example, all audio and image sources should be capable of being shown on the display and heard in the classroom. The work covered in this document consists of furnishing all labor, material and services necessary to install a complete audiovisual system as indicated on the project drawings and in these specifications.
- B. Deliverables: Prior to ordering materials or commencing any construction activities, the Integrator shall provide the Owner with a complete bill of materials, including all quantities of components, devices, equipment, and wiring required to complete this work. Submit product data, including manufacturer's data sheets for all proposed system components. Submit three copies with all specific items that will be provided clearly indicated and any options highlighted.

PART 2 - PRODUCTS**2.1 SYSTEM DESCRIPTION**

- A. Provide a complete Audiovisual System for Building B Classrooms, Building B Staff Lounge and the Building A Library. The system switching and audio amplification equipment shall be securely mounted and concealed in an enclosure mounted in close proximity to the display device. Audio and image source equipment can be connected to the system and displayed via active (powered) interface panels located throughout the room. The audio and image signals from source devices shall be transmitted from the active interface panels over shielded UTP cabling architecture.
- B. Classroom Definition: A classroom that has fixed instructional media video display capabilities, Internet connectivity at the teacher's station, student networking (usually wireless), a document camera, Blu-ray and/or other multimedia input devices, standard laptop interface, multimedia control system that is connected to the network and capabilities for additional add-on modular features.
- C. Technology Enhanced Classrooms (TECs) use standardized control/interface systems and employ a standardized operational protocol. The principles of this recommendation are to establish desirable goals with respect to classroom design and installed

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technology. The TEC classroom standard includes control systems that have ADA, Section 508 compliant buttons that are discernible without activating the controls or buttons on the control panel, easily reached control panel locations, closed captioning, hearing assistance capability, and user friendly operator protocols among the features that are consistent with universal design principles.

- D. All new construction general purpose classrooms will meet this minimum standard. The standard will be met in major renovations wherever possible. The standard will be retrofitted in existing general purpose classrooms according to an established upgrade plan.

2.2 GENERAL EQUIPMENT REQUIREMENTS

- A. The room will be equipped with a standard easy to operate interface (a tactile button keypad layout). The audio system may be monaural or stereo for program sound. The instructional media system will be controlled by a control system with a control panel mounted near the instructor area. System parameters can be monitored, administered and controlled over the data network. The instructional media equipment will be located within close proximity to the instructor area or through a Graphical User Interface (GUI) on a computer to allow for ease of operation during instruction.
- B. Acceptable functionality requirements are listed below categorized by type of equipment. Quantities are listed for movable, portable or loose equipment, and other selected entries. Where quantities are not listed, refer to the system drawings.
- C. The System components shall all be correctly listed and labeled by Underwriters Laboratories Incorporated (UL) for their intended use.
- D. All products shall be new and under warranty at the time of installation. B-stock, previously installed, refurbished, or used equipment shall not be provided on this project.
- E. Where the specification lists several manufacturers for a major item, or group of items, the AV Integrator shall provide that entire item from one manufacturer only.
- F. The Integrator shall provide all options, accessories, and hardware necessary to meet the function of the design even if they are not specifically listed (i.e. mounting kits, separate or additional power supplies, input modules, transformers, etc.).

2.3 FIXED EQUIPMENT

- A. BUILDING B: KINDERGARTEN (ROOM 1), CLASSROOM (ROOM 2), AND STAFF LOUNGE (ROOM 3)

Provide the following Audio Video System as an all-inclusive system as described below, one system for each room:

1. Mounting - The audio, video, data connectivity components and display, if applicable, shall be mounted using the following components.

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- a. Multi-Product Plenum Mounting Kit
- b. The Extron PVM 220 PlenumVault Mounting Kit is a secure, fully enclosed housing for storing PoleVault AV system components in the plenum space above a suspended ceiling. The 2' x 2' enclosure provides ample space for mounting a variety of devices and offers four integrated AC outlets. The hinged door provides access for setup and maintenance tasks. To maintain room aesthetics, the PVM 220 accepts a trimmed tile to blend in with the rest of the ceiling.
- c. Media Source Switching:
 - 1) The switcher shall have two (2) inputs that each support connection to a dual input switching wallplate via one (1) female RJ-45 connector.
 - 2) Audio for switched video sources shall be carried on the same RJ-45 connections.
 - 3) The switcher shall have a switched auxiliary audio input to support audio from video sources that are directly connected to the projector or sources that only offer audio content.
 - 4) The switcher shall have one HDMI video output
 - 5) Connection from the switcher to the display device shall be provided with one HDMI to HDMI video cable.
 - 6) An onboard audio amplifier shall provide gain / volume adjustment from -10db to +10db, adjustable in 1 db steps. The speaker amplifier shall have two (2) channels, one (1) stereo (default) or dual (2) mono channels via one (1) 5.0 mm 4 pole captive screw connector. The output of the amplifier shall be 25 watts (rms) per channel at 4/8 ohms.
 - 7) In addition to the stereo / mono speaker output, an additional audio output that will produce line level output shall also be available. This line level audio output must be capable for being set at either "fixed" or "variable" and with Balanced or Unbalanced settings.
2. Media Source Control:
 - a. Classroom media sources shall be controlled with an MLC Plus 200 MediaLink Controller.
 - 1) The MediaLink Controller shall contain ten dual color, multi-status LEDs push-buttons for device selection and display on / off control. A rotary volume control knob with volume indicators shall permit system volume level control.
 - 2) Connection from the MLC Controller to the display shall be provided by one (1) 50' control cable.
 - 3) Connection from the MLC Controller to the PVS AV Switcher shall be provided by one (1) 50' Control cable and (1) category 6 cable.
3. Audio & Speech Reinforcement:

- a. Speakers - In suspended ceiling applications, one (1) pair of Extron FF120 speakers are used.
 - 1) These speakers feature a low profile, 3.25" deep, aluminized composite enclosure, rectangular shape with a metal grille.
 - 2) The coverage angle of the speaker offers an extraordinarily wide dispersion area of 170 degrees, providing a very wide room coverage pattern.
 - 3) Meeting the regulatory compliance safety specifications of NFPA90A, NFPA70;
UL Listed for use in plenum airspaces: meets UL 2043 for heat and smoke release, meets UL 1480 for commercial and professional audio
 - 4) The speakers feature a frequency response of 68 Hz to 18 kHz – 10 db, half space.
 - 5) The power capacity is 16 watts of continuous pink noise or 32 watts of continuous program media.
 - 6) The nominal impedance is 8 ohms.
 - 7) The input connector uses (1) 5mm captive screw for 1 input
 - 8) Connection from the PVS AV switcher to the FF120 speaker is provided by Plenum rated 18 Gauge Speaker Cable Extron SPK-18.
- b. VoiceLift Wireless RF Microphone:
 - 1) The integrated wireless microphone is lightweight and designed to be worn around the neck with a lanyard or clipped on the belt or lapel. The instructor's voice is picked up by the microphone and transmitted wirelessly to the receiver mounted within the PlenumVault. The signal is then passed to the line level aux mix input of the amplifier. This is used to amplify the sound level in the classroom up to approximately 15 dB above ambient room noise.
 - 2) Speech is mixed with the program audio and distributed out of the four (4) each speakers for even room coverage. Each microphone shall have volume control, a power switch and an auxiliary input to use for a MP3 player or other audio source.
 - 3) The microphone will have an instant alert feature that may be configured to allow the instructor to request assistance in the classroom.
- c. VoiceLift Wireless RF Receiver
 - 1) The RF Receiver must be mounted securely within the PlenumVault with cables run to the dedicated VoiceLift Receiver input of the PVS AV Switcher.
 - 2) This device acts as the receiver of up to two room microphones and transmits their audio signal to the PVS AV Switcher for mix into the program content of presented material. The receiver has a contact closure that when wired and configured to the digital input of the MLC,

can trigger instant alert messages to a designated text or email account.

d. VoiceLift Wireless RF Microphone Charging Station

- 1) This device is constructed of high impact ABS plastic and acts as a holding and charging station of up to two of the Extron VoiceLift wireless RF microphones. It ships with its own power supply that acts as a recharging station for the two microphones.

4. Media Source Interfacing:

The media source equipment shall be connected to the audiovisual system via two (2) Active (powered) dual input, switching wall plates and one (1) single gang pass-through wallplate with a 3.5 mm stereo mini audio jack. These wall plates shall enable the system to display video, graphic data and audio from Laptop computers, tablets, Blu-ray plates, document cameras, streaming devices, tuners, etc.

These active interface transmitters shall be placed in convenient locations throughout the classroom to facilitate easy connection of sources.

- a. Two (2) PVT HDMI, Dual HDMI Input Wallplate shall be used to connect two HDMI devices to the system and transmit the video and audio data from either source to the PVS AV switcher.
 - 1) Active Twisted Pair Transmitter shall transmit high resolution digital video and audio over shielded CAT 6 cable to the PVS AV Switcher
 - 2) Wallplate shall offer two (2) female HDMI connectors for interfacing with video source devices
 - 3) Wall plate shall fit in a standard, 2-gang electrical box and feature Decora® type faceplates.
 - 4) One (1) stereo audio input on 3.5mm mini stereo jack shall be available for each video input
 - 5) The output of the interface shall be via one (1) female RJ-45 connector
 - 6) Connection to the PVS AV Switcher shall be via one (1) UL plenum rated shielded UTP cable.
- b. One (1) WPD 101 3.5 mm single gang pass-through wallplate with a 3.5 mm stereo mini audio jack shall be used to connect audio devices to the PVS AV switcher.
 - 1) WPD 101 3.5 mm single gang pass-through wallplate shall fit in a standard, 3-gang electrical box along with (1) PVT HDMI dual-gang HDMI input wallplate and feature Decora® type faceplates.
 - 2) Connection to the PVS AV Switcher shall be via one (1) 50' control cable.

5. Data Connectivity

The audio video system shall incorporate features that expand access and connectivity to an existing data network

- a. The PVS Switcher shall incorporate a three port network switch, allowing a single network drop to provide connectivity for the switcher, the MediaLink controller, and one additional device.
- b. The audio video system shall include a IP Link enabled MediaLink controller, also connected to the network switch in the PVS Switcher, allowing remote monitoring, scheduling and control of the system over a network.

6. Energy Efficiency

The audio video system shall incorporate energy conservation features to reduce consumption and lower operating costs.

- a. The system shall incorporate an Auto Power Save Mode with fast power-up that automatically deactivates the audio amplifier after 30 minutes of inactivity. It quickly returns to full power status in less than one second upon signal detection
- b. The system shall incorporate a Standby Mode that allows the amplifier and twisted pair transmitters to be deactivated when not in use.
- c. The system shall incorporate monitoring and scheduling of system peripherals, such as sources and displays, in order to deactivate them when not in use or alert to unauthorized use.

B. BUILDING A: LIBRARY (ROOM 1)

Provide the following Audio Video System as an all-inclusive system as described below, one system for each room:

1. Mounting - The audio, video, data connectivity components and display, if applicable, shall be mounted using the following components.
 - a. Multi-Product Plenum Mounting Kit
 - b. The Extron PVM 220 PlenumVault Mounting Kit is a secure, fully enclosed housing for storing PoleVault AV system components in the plenum space above a suspended ceiling. The 2' x 2' enclosure provides ample space for mounting a variety of devices and offers four integrated AC outlets. The hinged door provides access for setup and maintenance tasks. To maintain room aesthetics, the PVM 220 accepts a trimmed tile to blend in with the rest of the ceiling.
 - c. Media Source Switching:

System source selection and switching shall be provided by a PVS 407D Switcher.

 - 1) The switcher shall have two (2) inputs that each support connection to a dual input switching wallplate via one (1) female RJ-45 connector.
 - 2) Audio for switched video sources shall be carried on the same RJ-45 connections.

- 3) The switcher shall have a switched auxiliary audio input to support audio from video sources that are directly connected to the projector or sources that only offer audio content.
 - 4) The switcher shall have one HDMI video output
 - 5) Connection from the switcher to the display device shall be provided with one HDMI to HDMI video cable.
 - 6) An onboard audio amplifier shall provide gain / volume adjustment from -10db to +10db, adjustable in 1 db steps. The speaker amplifier shall have two (2) channels, one (1) stereo (default) or dual (2) mono channels via one (1) 5.0 mm 4 pole captive screw connector. The output of the amplifier shall be 25 watts (rms) per channel at 4/8 ohms.
 - 7) In addition to the stereo / mono speaker output, an additional audio output that will produce line level output shall also be available. This line level audio output must be capable for being set at either "fixed" or "variable" and with Balanced or Unbalanced settings.
2. Media Source Control:
- a. Library media sources shall be controlled with two (2) EBP 200 eBUS – 3-Gang 10 Button Panels.
 - 1) The EBP 200 eBUS Button Panel shall contain ten dual color, multi-status LEDs push-buttons for device selection and display on / off control. A rotary volume control knob with volume indicators shall permit system volume level control.
 - 2) Connection from each EBP 200 eBUS Button Panel to the EBDB Mini – Mini Distribution Hub shall be provided by one (1) Category 6 cable and two (2) CSC 6 – Captive Screw to Category Cable Adapters.
 - 3) Connection from the EBDB Mini – Mini Distribution Hub to the IPCP Pro 250 -IP Link Pro Control Processor shall be provided by one (1) 4C/20AWG cable.
 - 4) Connection from the IPCP Pro 250 -IP Link Pro Control Processor to the PVS AV Switcher shall be provided by one (1) Category 6 cable and one (1) 50' control cable.
 - 5) Connection from the IPCP Pro 250 -IP Link Pro Control Processor to the display shall be provided by one (1) 50' control cable.
3. Audio & Speech Reinforcement:
- a. Speakers - In suspended ceiling applications, two (2) pair of Extron FF120 speakers are used.
 - 1) These speakers feature a low profile, 3.25" deep, aluminized composite enclosure, rectangular shape with a metal grille.
 - 2) The coverage angle of the speaker offers an extraordinarily wide dispersion area of 170 degrees, providing a very wide room coverage pattern.

- 3) Meeting the regulatory compliance safety specifications of NFPA90A, NFPA70;
UL Listed for use in plenum airspaces: meets UL 2043 for heat and smoke release, meets UL 1480 for commercial and professional audio
 - 4) The speakers feature a frequency response of 68 Hz to 18 kHz – 10 db, half space.
 - 5) The power capacity is 16 watts of continuous pink noise or 32 watts of continuous program media.
 - 6) The nominal impedance is 8 ohms.
 - 7) The input connector uses (1) 5mm captive screw for 1 input
 - 8) Connection from the PVS AV switcher to the FF120 speaker is provided by Plenum rated 18 Gauge Speaker Cable Extron SPK-18.
- b. VoiceLift Wireless RF Microphone:
- 1) The integrated wireless microphone is lightweight and designed to be worn around the neck with a lanyard or clipped on the belt or lapel. The instructor's voice is picked up by the microphone and transmitted wirelessly to the receiver mounted within the PlenumVault. The signal is then passed to the line level aux mix input of the amplifier. This is used to amplify the sound level in the classroom up to approximately 15 dB above ambient room noise.
 - 2) Speech is mixed with the program audio and distributed out of the four (4) each speakers for even room coverage. Each microphone shall have volume control, a power switch and an auxiliary input to use for a MP3 player or other audio source.
 - 3) The microphone will have an instant alert feature that may be configured to allow the instructor to request assistance in the classroom.
- c. VoiceLift Wireless RF Receiver
- 1) The RF Receiver must be mounted securely within the PlenumVault with cables run to the dedicated VoiceLift Receiver input of the PVS AV Switcher.
 - 2) This device acts as the receiver of up to two room microphones and transmits their audio signal to the PVS AV Switcher for mix into the program content of presented material. The receiver has a contact closure that when wired and configured to the digital input of the MLC, can trigger instant alert messages to a designated text or email account.
- d. VoiceLift Wireless RF Microphone Charging Station
- 1) This device is constructed of high impact ABS plastic and acts as a holding and charging station of up to two of the Extron VoiceLift wireless RF microphones. It ships with its own power supply that acts as a recharging station for the two microphones.

4. Media Source Interfacing:

The media source equipment shall be connected to the audiovisual system via two (2) Active (powered) dual input, switching wall plates and one (1) single gang pass-through wallplate with a 3.5 mm stereo mini audio jack. These wall plates shall enable the system to display video, graphic data and audio from Laptop computers, tablets, Blu-ray plates, document cameras, streaming devices, tuners, etc.

These active interface transmitters shall be placed in convenient locations throughout the classroom to facilitate easy connection of sources.

- a. Two (2) PVT HDMI, Dual HDMI Input Wallplate shall be used to connect two HDMI devices to the system and transmit the video and audio data from either source to the PVS AV switcher.
 - 1) Active Twisted Pair Transmitter shall transmit high resolution digital video and audio over shielded CAT 6 cable to the PVS AV Switcher
 - 2) Wallplate shall offer two (2) female HDMI connectors for interfacing with video source devices
 - 3) Wall plate shall fit in a standard, 2-gang electrical box and feature Decora® type faceplates.
 - 4) One (1) stereo audio input on 3.5mm mini stereo jack shall be available for each video input
 - 5) The output of the interface shall be via one (1) female RJ-45 connector
 - 6) Connection to the PVS AV Switcher shall be via one (1) UL plenum rated shielded UTP cable.
- b. One (1) WPD 101 3.5 mm single gang pass-through wallplate with a 3.5 mm stereo mini audio jack shall be used to connect audio devices to the PVS AV switcher.
 - 1) WPD 101 3.5 mm single gang pass-through wallplate shall fit in a standard, 3-gang electrical box along with (1) PVT HDMI dual-gang HDMI input wallplate and feature Decora® type faceplates.
 - 2) Connection to the PVS AV Switcher shall be via one (1) 50' control cable.

5. Data Connectivity

The audio video system shall incorporate features that expand access and connectivity to an existing data network

- a. The PVS Switcher shall incorporate a three port network switch, allowing a single network drop to provide connectivity for the switcher, the MediaLink controller, and one additional device.
- b. The audio video system shall include a IP Link enabled MediaLink controller, also connected to the network switch in the PVS Switcher, allowing remote monitoring, scheduling and control of the system over a network.

6. Energy Efficiency

The audio video system shall incorporate energy conservation features to reduce consumption and lower operating costs.

- a. The system shall incorporate an Auto Power Save Mode with fast power-up that automatically deactivates the audio amplifier after 30 minutes of inactivity. It quickly returns to full power status in less than one second upon signal detection
- b. The system shall incorporate a Standby Mode that allows the amplifier and twisted pair transmitters to be deactivated when not in use.
- c. The system shall incorporate monitoring and scheduling of system peripherals, such as sources and displays, in order to deactivate them when not in use or alert to unauthorized use.

PART 3 - EXECUTION**3.1 GENERAL**

- A. All equipment and enclosures described in this specification shall be installed plumb and square per manufacturer's instructions.
- B. All equipment, except that designated as movable, portable or loose equipment, shall be secured and permanently attached to the permanent structure in a manner which will require the use of a tool (e.g.: screw driver, nut driver, etc.) for removal.
- C. All supports shall meet or exceed the load requirements of the intended application with a minimum safety factor of five.
- D. Provide support structure and hardware with a SAE Grade 8 load rating (min.).

3.2 ACCEPTABLE MANUFACTURERS – SYSTEMS

- A. Manufacturer
Extron Electronics
1230 South Lewis Street
Anaheim, Ca 92805
714.491.1500 or 800.633.9876
- B. System
PlenumVault Digital Classroom AV System
- C. Substitutions: Exceptions to the specifications are not acceptable. No substitutions are permitted.

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- D. All equipment part numbers shall be listed in the bill of materials and the system drawings specifications.

3.3 EXAMINATION

- A. Site Verification of Conditions: Verify that related conditions, including equipment that has been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
- B. All devices connected to equipment specified in this section shall bear the UL label and comply with the applicable California Electrical Code (CEC) standards.

3.4 INSTALLATION

- A. Integrator shall furnish all equipment, labor, system setup, and other services necessary for the proper installation of the products/system as indicated on the drawings and specified herein. System setup information shall include each components proper mounting and alignment and properly verified signal pathways and operation. Proper operational and network support control functions shall be verified.
- B. Install in accordance with manufacturer's handling and installation instructions.
- C. Install in accordance with all local and pertaining codes and regulations
- D. Utilize an Integrator with demonstrated experience in projects of similar size and complexity.
- E. Equipment shall be configured and in ready to use condition at the end of installation.
- F. Energize and commission equipment in accordance with manufacturer's instructions. Commissioning the system shall at minimum, consist of the following:
 - Install Global Configurator software on PC
 - Download from www.extron.com, or install from Extron Software Products CD
 - Make the following MLC cable connections
 - Power
 - Local Area Network (LAN)
 - Classroom Source Devices
 - Configure MLC Plus 200 Series using Global Configurator
 - Download device drivers for all source and projection devices
 - Create a new Global Configurator project file
 - Add a device and set its IP address, gateway, and subnet (District to provide block of static IPs)
 - Reseller to be responsible for proper configuration of each room to assigned IP addresses (the number of devices and IP addresses may vary depending on configuration).

Define the location of the new Media Source Control device
Save the new Global Configurator file
Configure e-mail server
Configure e-mail messages
Configure contacts
Assign serial device drivers
Assign IR drivers
Configure the front panel (All buttons are required to have a function assigned: source or control)
Configure associated control modules
Create a shutdown schedule
Create a disconnect notice
Build the Global Configurator file
Upload the Global Configurator file
Launch GlobalViewer
Test the Media Source Control's setup in all rooms for proper control and support of the space.
During this portion, reseller must show and confirm GlobalViewer is operational, monitors and schedules are installed correctly, per District Requirements, fully test room system for operation and functionality.
Installation of the Extron system is covered in full detail at <http://www.extron.com/training/index.aspx>

3.5 PROTECTION AND CLEANING

- A. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
- B. Repair or replace damaged components before Substantial Completion of the project.
- C. Remove temporary tags, coverings, and construction debris from interior and exterior surfaces of the equipment. Remove construction debris from equipment area and dispose of properly.

END OF SECTION 27 41 16.51

SECTION 27 51 26
ASSISTIVE LISTENING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes assistive listening systems.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include material descriptions, dimensions of individual components and profiles.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
 - 1. Include diagrams for power, signal, and storage location(s).

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For manufacturer's warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For Assistive Listening System to include operation and maintenance manuals.

1.6 REGULATORY REQUIREMENTS

- A. Assistive listening systems shall be provided in accordance with CBC Section 11B-219 and shall comply with CBC Section 11B-706.

- B. Per CBC Section 11B-219.3, the minimum number of receivers to be provided for each assistive listening system shall be equal to 4% of the total number of seats, but in no case less than two. 25% minimum of receivers provided, but no fewer than two, shall be hearing-aid compatible in accordance with CBC Section 11B-706.3.
- C. If the assistive listening system provided is limited to specific areas or seats, then such areas or seats shall be within a 50-foot viewing distance of, and have a complete view of, the stage or playing area. CBC Section 11B-219.4.
- D. Per April 2020 DSA Code Appeal interpretation, school facilities may use the following alternate provision; provide (2) portable assistive listening systems, each with a transmitter and a minimum of 2 receivers for the use in classrooms without audio amplification. The assistive listening receivers and transmitter(s) shall be stored in the school site administration office until requested. In addition, provide an assistive listening system for each assembly area such as multi-purpose rooms, cafeterias, lecture halls, conference rooms or other assembly areas as defined by the CBC. If the assembly area has no fixed seating, calculate the number of seats using 7 SF per occupant. Provide 4% of assistive listening receivers for total number of seats in each assembly area, but no less than 2. The assistive listening receivers and respective transmitter should be stored in or near the assembly area that it serves.
- E. Refer to the Assistive Listening System (ALS) schedule on the ET construction drawings. Provide assistive listening systems to comply with the most stringent requirements.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and/or Installer agree to repair or replace components of the Assistive Listening System that fail(s) in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 3 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

3. Listen Technologies.
4. Or Equal.

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- B. The hearing assist systems shall be RF type and deployed to provide noise free coverage of the classrooms, conference rooms and other CBC defined assembly areas.

2.3 PORTABLE, WIRELESS ASSISTIVE LISTENING SYSTEMS

- A. The portable, wireless Assistive Listening Systems shall be packaged in portable cases complete with all the components of the Assistive Listening System.
- B. The transmitter shall be portable complete with power supply, antenna, connectors for balanced and un-balanced inputs, group channels and volume adjustment. The transmitter shall have the following performance characteristics:
 1. RF Frequency Range 1.9 GHz PCS Band
 2. Security 32-bit and 64-bit encryption
 3. Groups 10 Simultaneous
 4. Power Lithium-ion
 5. Headset Connection 3.5 MM Stereo
 6. Frequency Response 40 to -15 MHz (\pm 3dB)
 7. Signal to Noise Ratio 70 db.
 8. Display 64 x 128 OLED
- C. Receivers shall be portable and compatible with the transmitter and shall have the following characteristics and or features:
 1. RF Frequency Range 1.9 GHz PCS Band
 2. Security 32-bit and 64-bit encryption
 3. Groups 10 Simultaneous
 4. Power Lithium-ion
 5. Headset Connection 3.5 MM Stereo
 6. Frequency Response 40 to -15 MHz (\pm 3dB)
 7. Signal to Noise Ratio 70 db.
 8. Headphones Stereo Ear Bud
 9. Hearing Aid Capable 25%
- D. ACCESSORIES
 1. Furnish transmitter and receiver carrying case with capabilities for charging of the receiver units. The carrying case shall be capable of storing and charging 16 individual receivers.

ASSISTIVE LISTENING SYSTEMS

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2. Furnish all interconnection cables as required.
3. Furnish four (4) spare ear bud covers with each carrying case.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Comply with NECA 1.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
 1. Perform Sound System tests and adjustments in the presence of the Project Inspector and District's operating personnel.
- B. Prepare test and inspection reports.

3.3 DEMONSTRATION

- A. Engage a factory-authorized service representative to train District's maintenance personnel to adjust, operate, and maintain assistive listening systems and related components.

END OF SECTION 27 51 26

**SECTION 27 53 13
CLOCK SYSTEMS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Wireless master clock transmitter.
 - 2. Wireless secondary indicating clocks.

1.3 DEFINITIONS

- A. GPS: Global positioning system.
- B. NTP: Network time protocol.
- C. UTC: Universal time coordinated. The precisely measured time at zero degrees longitude; a worldwide standard for time synchronization.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes (including available colors) for each product indicated and describe features and operating sequences, both automatic and manual, for the following:
 - 1. Wireless master clock transmitter.
 - 2. Wireless secondary indicating clocks.
 - 3. Accessory components.
 - 4. Example of clock face with District logo.
- B. Shop Drawings: For clock systems. Include plans, elevations, sections, details, and attachments to other work.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For clock and program control to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- B. Comply with CEC.

PART 2 - PRODUCTS**2.1 WIRELESS MASTER CLOCK TRANSMITTER**

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Innovation Wireless.
- B. The campus shall be served by one single Manufacturer's clock system transmitter.
- C. Wireless Transmitter: The transmitter must be mounted in an internal location, and may be mounted as a standalone unit, or as part of a rack system. The wireless transmitter shall tie to the campus wide intercom/public address system to provide time synchronization for class passing bell tones and or existing class passing bells. Display and associated buttons on the transmitter shall allow for the programming and display of the following operating features:
 - 1. Master Transmitter: Shall have an internal clock that will guarantee the operation of the clocks will continue to be synchronized in the event of a temporary GPS failure.
 - 2. Time Zones: Display and programming must allow for the selection and display of time zones for all of North America: Eastern, Central, Mountain, Pacific, Alaska, and Hawaii. It must allow for all international time zone options.
 - 3. Daylight Saving Time: Transmitter must allow for automatic adjustment of the system to allow it to be active or inactive.
 - 4. 12hr or 24hr Operation: System must allow for programming desired method of operation on the face of transmitter.
 - 5. Frequency Range: 467.2125 – 467.4375 MHz
 - 6. Programming: All programming of operating features must occur at the master transmitter and all changers must be able to be viewed on the digital display as the changes are being programmed.
 - 7. Channels: Transmitter shall have ten (10) selectable channels to ensure interference free reception.

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8. Transmitter Power: Five (5) watts.
9. Transmission Range: Up to two (2) miles radius (transmitter power dependent).
10. Operating Range: 32° F to 158° F.
11. Radio Technology: Narrowband FM, bandwidth.
12. Power Supply: Power supply shall be included with the transmitter.

- a. Input: 120 volt ac, 50/60 Hz.
- b. Output: 12 volt dc, 3 amps.

13. Surge Protector Backup: Shall be provided as optional equipment if specified:

- a. Input: 120 volt ac, 60 Hz +/- 1 Hz.
- b. Output: 120 volt ac, 550 VA, 300 watts.
- c. Surge Energy Rating: 365 joules.

D. GPS Receiver:

1. GPS roof mounted receiver shall be provided with an appropriate length of cable, made up as one piece without splices.
2. The GPS receiver shall be watertight and have a built-in receiver. Provide a GPS mounting bracket for secure roof mount or side wall installation.

E. Provision for Modular Panel Installation: Designated clocks shall be equipped for panel mounting. Mount flush or semi-recessed with arrangement and trim as specified. Coordinate wiring with other modular panel components including room lighting switches, intercom devices, convenience outlets, data outlets, speakers and other devices.

F. Provision for Time-Tone-Unit Installation: Designated clocks shall be equipped for housing or mounting in an acoustically treated and baffled speaker compartment as specified in Section 27 51 16 "Public Address Systems."

2.2 WIRELESS SECONDARY INDICATING CLOCKS

- A. Analog Clock: Equipped with a sweep second hand. Movement shall be driven by self-starting, permanently lubricated, sealed synchronous motor equipped with a correcting solenoid actuator, or be a microprocessor-based, second impulse unit, compatible with the master clock.
- B. Power: Provide (2) "D" batteries and ac power adapter. Clocks shall be capable of either power source.
- C. Logo: Clocks shall have the District logo on the face of the clock.
- D. Features:
 1. Clocks shall automatically update from the transmitter at regular daily intervals. Clocks shall automatically adjust for Daylight Savings Time, if option is specified.

2. Clocks shall remain operational and synchronized if the GPS or NTP signal is lost due to GPS or NTP failure. Once signal is re-acquired, clocks shall resume GPS or NTP time synchronization.
 3. Clocks shall keep operating as quartz based clocks if there is a transmitter malfunction.
- E. Models:
1. 13-inch standard model for classrooms and offices.
 2. 16-inch standard for larger areas (Library and hallways).
- F. Provision for Time-Tone-Unit Installation: Equip indicated clocks for housing or mounting in an acoustically treated and baffled speaker compartment.
- G. Secondary Indicating Clock Characteristics:
1. Clock Type: Analog.
 2. Face Configuration: Single.
 3. Mounting: Surface.
 4. Casing Finish: Black ABS.
 5. Dial Face Color: White.
 6. Analog Clock Crystal: Clear polycarbonate.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Mount system components with fastening methods and devices designed to resist the seismic forces indicated in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installation, including connections.
- B. Tests and Inspections:
1. Perform operational-system tests to verify compliance with the Specifications and make adjustments to bring system into compliance. Include operation of all modes of clock correction and all programming and manually programmed signal and relay operating functions.
- C. Clock system will be considered defective if it does not pass tests and inspections.

- D. Prepare test and inspection reports.

3.3 ADJUSTING

- A. Program system according to District's requirements. Set system so signal devices operate on District-required schedules and are activated for durations selected by District. Program equipment-control output circuits to suit District's operating schedule for equipment controlled.
- B. Adjust sound-output level of adjustable signal devices to suit District's requirements.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train District's maintenance personnel to adjust, operate, and maintain clock-and-program-control system components.

END OF SECTION 27 53 13

SECTION 28 31 00
INTRUSION DETECTION

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY**A. Section Includes:**

- 1. Intrusion detection with communication links to perform monitoring, alarm, and control functions.
- 2. Integration of other electronic and electrical systems and equipment.

B. Related Sections:

- 1. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for power cabling between master control units and field-mounted devices and control units.
- 2. Section 271323 "Communications Optical Fiber Backbone Cabling" for multi- and single-mode backbone (riser-rated) optical fiber.
- 3. Section 271513 "Communications Copper Horizontal Cabling" for Category 5e, 6, and 7 horizontal (general use, riser-, and plenum-rated) cabling.

1.3 DEFINITIONS

- A. CCTV: Closed-circuit television.
- B. PIR: Passive infrared.
- C. RFI: Radio-frequency interference.
- D. UPS: Uninterruptible power supply.
- E. Control Unit: System component that monitors inputs and controls outputs through various circuits.
- F. Master Control Unit: System component that accepts inputs from other control units and may also perform control-unit functions. The unit has limited capacity for the

number of protected zones and is installed at an unattended location or at a location where it is not the attendant's primary function to monitor the security system.

- G. Monitoring Station: Facility that receives signals and has personnel in attendance at all times to respond to signals. A central station is a monitoring station that is listed.
- H. Protected Zone: A protected premises or an area within a protected premises that is provided with means to prevent an unwanted event.
- I. Standard Intruder: A person who weighs 100 lb or less and whose height is 60 inches or less; dressed in a long-sleeved shirt, slacks, and shoes unless environmental conditions at the site require protective clothing.
- J. Standard-Intruder Movement: Any movement, such as walking, running, crawling, rolling, or jumping, of a "standard intruder" in a protected zone.
- K. Systems Integration: The bringing together of components of several systems containing interacting components to achieve indicated functional operation of combined systems.
- L. Zone. A defined area within a protected premises. It is a space or area for which an intrusion must be detected and uniquely identified. The sensor or group of sensors must then be assigned to perform the detection, and any interface equipment between sensors and communication must link to master control unit.

1.4 ACTION SUBMITTALS

- A. Product Data: Components for sensing, detecting, systems integration, and control, including dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.
 - 1. Functional Block Diagram: Show single-line interconnections between components including interconnections between components specified in this Section and those furnished under other Sections. Indicate methods used to achieve systems integration. Indicate control, signal, and data communication paths and identify control interface devices and media to be used. Describe characteristics of network and other data communication lines.
 - a. Indicate methods used to achieve systems integration.
 - b. Indicate control, signal, and data communication paths and identify PLCs, networks, control interface devices, and media to be used.
 - c. Describe characteristics of network and other data communication lines.
 - d. Describe methods used to protect against power outages and transient voltages including types and ratings of isolation and surge suppression

devices used in data, communication, signal, control, and ac and dc power circuits.

2. Raceway Riser Diagrams: Detail raceway runs required for intrusion detection. Include designation of devices connected by raceway, raceway type and size, and type and size of wire and cable fill for each raceway run.
 3. UPS: Sizing calculations.
 4. Site and Floor Plans: Indicate final outlet and device locations, routing of raceways, and cables inside and outside the building.
 5. Master Control-Unit Console Layout: Show required artwork and device identification.
 6. Device Address List: Coordinate with final system programming.
 7. System Wiring Diagrams: Include system diagrams unique to Project. Show connections for all devices, components, and auxiliary equipment. Include diagrams for equipment and for system with all terminals and interconnections identified.
 8. Details of surge-protection devices and their installation.
 9. Sensor detection patterns and adjustment ranges.
- C. Design Data: Include method of operation and supervision of each component and each type of circuit. Show sequence of operations for manually and automatically initiated system or equipment inputs. Description must cover this specific Project; manufacturer's standard descriptions for generic systems are unacceptable.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of exposed finish required.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and intrusion detection systems integrator.
- B. Field quality-control reports.
1. Anchor inspection reports documenting inspections of built-in and cast-in anchors.
- C. Product Warranty: Sample of special warranty.
- D. Field Test Reports: Test plan and report defining all tests required to ensure that system meets technical, operational, and performance specifications within 60 days of date of Contract award.
- E. Evaluation Reports: Examination reports documenting inspections of substrates, areas, and conditions.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For intrusion detection system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - 1. Data for each type of product, including features and operating sequences, both automatic and manual.
 - 2. Master control-unit hardware and software data.

1.7 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. Intrusion Detection Devices: Furnish quantity equal to five percent of the number of units of each type installed, but no fewer than one of each type.
 - 2. Fuses: Three of each kind and size.
 - 3. Tool Kit: Provide six sets of tools for use with security fasteners, each packaged in a compartmented kit configured for easy handling and storage.
 - 4. Security Fasteners: Furnish no fewer than 1 box for every 50 boxes or fraction thereof, of each type and size of security fastener installed.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. An employer of workers, at least one of whom is a Certified Alarm Technician, Level 1.
 - 2. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
 - 3. Layout Responsibility: Preparation of Shop Drawings by a Technician.
 - 4. Installation Supervision: Installation shall be under the direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.
 - 5. Testing Supervisor: Currently certified by BICSI as a Technician to supervise on-site testing.
- B. Intrusion Detection Systems Integrator Qualifications: An experienced intrusion detection equipment supplier and Installer who has completed systems integration work for installations similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
 - 1. At least one of whom is a Certified Systems Integrator.
- C. Testing Agency Qualifications: Certified by BICSI.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.9 PROJECT CONDITIONS

- A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
 1. Altitude: Sea level to 4000 feet.
 2. Master Control Unit: Rated for continuous operation in an ambient of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.
 3. Interior, Controlled Environment: System components, except master control unit, installed in air-conditioned temperature-controlled interior environments shall be rated for continuous operation in ambients of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing.
 4. Interior, Uncontrolled Environment: System components installed in non-air-conditioned non-temperature-controlled interior environments shall be rated for continuous operation in ambients of 0 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing.
 5. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambients of minus 30 to plus 122 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Comply with UL 294 and UL 639 for outdoor-use equipment. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick.
 6. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings shall be rated, listed, and installed according to CEC.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of intrusion detection devices and equipment that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 FUNCTIONAL DESCRIPTION OF SYSTEM**

- A. Description: Hard-wired, modular, microprocessor-based controls, intrusion sensors and detection devices, and communication links to perform monitoring, alarm, and control functions.
- B. Supervision: System components shall be continuously monitored for normal, alarm, and trouble conditions. Indicate deviations from normal conditions at any location in system. Indication includes identification of device or circuit in which deviation has occurred and whether deviation is an alarm or malfunction.
 - 1. Alarm Signal: Display at master control unit and actuate audible and visual alarm devices.
 - 2. Trouble Condition Signal: Distinct from other signals, indicating that system is not fully functional. Trouble signal shall indicate system problems such as battery failure, open or shorted transmission line conductors, or control-unit failure.
 - 3. Supervisory Condition Signal: Distinct from other signals, indicating an abnormal condition as specified for the particular device or control unit.
- C. System Control: Master control unit shall directly monitor intrusion detection units and connecting wiring.
- D. System Control: Master control unit shall directly monitor intrusion detection devices and connecting wiring in a multiplexed distributed control system or as part of a network.
- E. System shall automatically reboot program without error or loss of status or alarm data after any system disturbance.
- F. Security system shall not in any way limit or compromise exiting through all required exit access and exit discharge systems. Any security system penetration through rated assemblies shall be properly protected with a UL listed fire-stop installation matching the rating of the assembly.
- G. Operator Commands:
 - 1. Help with System Operation: Display all commands available to operator. Help command, followed by a specific command, shall produce a short explanation of the purpose, use, and system reaction to that command.
 - 2. Acknowledge Alarm: To indicate that alarm message has been observed by operator.
 - 3. Place Protected Zone in Access: Disable all intrusion-alarm circuits of a specific protected zone. Tamper circuits may not be disabled by operator.
 - 4. Place Protected Zone in Secure: Activate all intrusion-alarm circuits of a protected zone.
 - 5. Protected Zone Test: Initiate operational test of a specific protected zone.

6. System Test: Initiate system-wide operational test.
 7. Print reports.
- H. Timed Control at Master Control Unit: Allow automatically timed "secure" and "access" functions of selected protected zones.
- I. Automatic Control of Related Systems: Alarm or supervisory signals from certain intrusion detection devices control the following functions in related systems:
1. Switch selected lights.
 2. Shift elevator control to a different mode.
 3. Open a signal path between certain intercommunication stations.
 4. Shift sound system to "listening mode" and open a signal path to certain system speakers.
 5. Switch signal to selected monitor from CCTV camera in vicinity of sensor signaling an alarm.
- J. Printed Record of Events: Print a record of alarm, supervisory, and trouble events on system printer. Sort and report by protected zone, device, and function. When master control unit receives a signal, print a report of alarm, supervisory, or trouble condition. Report type of signal (alarm, supervisory, or trouble), protected zone description, date, and time of occurrence. Differentiate alarm signals from other indications. When system is reset, report reset event with the same information concerning device, location, date, and time. Commands shall initiate the reporting of a list of current alarm, supervisory, and trouble conditions in system or a log of past events.
- K. Response Time: Two seconds between actuation of any alarm and its indication at master control unit.
- L. Circuit Supervision: Supervise all signal and data transmission lines, links with other systems, and sensors from master control unit. Indicate circuit and detection device faults with both protected zone and trouble signals, sound a distinctive audible tone, and illuminate an LED. Maximum permissible elapsed time between occurrence of a trouble condition and indication at master control unit is 20 seconds. Initiate an alarm in response to opening, closing, shorting, or grounding of a signal or data transmission line.
- M. Programmed Secure-Access Control: System shall be programmable to automatically change status of various combinations of protected zones between secure and access conditions at scheduled times. Status changes may be preset for repetitive, daily, and weekly; specially scheduled operations may be preset up to a year in advance. Manual secure-access control stations shall override programmed settings.
- N. Manual Secure-Access Control: Coded entries at manual stations shall change status of associated protected zone between secure and access conditions.

2.2 SYSTEM COMPONENT REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- B. Control Units, Devices, and Communications with Monitoring Station: Listed and labeled by a qualified testing agency for compliance with SIA CP-01.
- C. FM Global Compliance: FM-Approved and -labeled intrusion detection devices and equipment.
- D. Comply with CEC.
- E. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor entry connection to components.
 - 1. Minimum Protection for Power Lines 120 V and More: Auxiliary panel suppressors complying with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."
 - 2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Lines: Listed and labeled by a qualified testing agency for compliance with NFPA 731.
- F. Intrusion Detection Units: Listed and labeled by a qualified testing agency for compliance with UL 639.
- G. Interference Protection: Components shall be unaffected by radiated RFI and electrical induction of 15 V/m over a frequency range of 10 to 10,000 MHz and conducted interference signals up to 0.25-V rms injected into power supply lines at 10 to 10,000 MHz.
- H. Tamper Protection: Tamper switches on detection devices, control units, annunciators, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled and when entering conductors are cut or disconnected. Master control-unit alarm display shall identify tamper alarms and indicate locations.
- I. Self-Testing Devices: Automatically test themselves periodically, but not less than once per hour, to verify normal device functioning and alarm initiation capability. Devices transmit test failure to master control unit.
- J. Antimasking Devices: Automatically check operation continuously or at intervals of a minute or less, and use signal-processing logic to detect blocking, masking, jamming, tampering, or other operational dysfunction. Devices transmit detection of operational dysfunction to master control unit as an alarm signal.

- K. Addressable Devices: Transmitter and receivers shall communicate unique device identification and status reports to master control unit.
- L. Remote-Controlled Devices: Individually and remotely adjustable for sensitivity and individually monitored at master control unit for calibration, sensitivity, and alarm condition.

2.3 ENCLOSURES

- A. Interior Sensors: Enclosures that protect against dust, falling dirt, and dripping noncorrosive liquids.
- B. Interior Electronics: NEMA 250, Type 12.
- C. Corrosion Resistant: NEMA 250, Type 4X, PVC.
- D. Screw Covers: Where enclosures are readily accessible, secure with security fasteners of type appropriate for enclosure.

2.4 SECURE AND ACCESS DEVICES

- A. Keypad and Display Module: Arranged for entering and executing commands for system-status changes and for displaying system-status and command-related data.
- B. Key-Operated Switch: Change protected zone between secure and access conditions.

2.5 DOOR AND WINDOW SWITCHES

- A. Description: Balanced-magnetic switch, complying with UL 634, installed on frame with integral overcurrent device to limit current to 80 percent of switch capacity. Bias magnet and minimum of two encapsulated reed switches shall resist compromise from introduction of foreign magnetic fields.
- B. Flush-Mounted Switches: Unobtrusive and flush with surface of door and window frame.
- C. Overhead Door Switch: Balanced-magnetic type, listed for outdoor locations, and having door-mounted magnet and floor-mounted switch unit.
- D. Remote Test: Simulate movement of actuating magnet from master control unit.

2.6 PIR SENSORS

- A. Listed and labeled by a qualified testing agency for compliance with SIA PIR-01.

- B. Description: Sensors detect intrusion by monitoring infrared wavelengths emitted from a human body within their protected zone and by being insensitive to general thermal variations.
1. Wall-Mounted Unit Maximum Detection Range: 125 percent of indicated distance for individual units and not less than 50 feet. Provide adjustable coverage pattern as indicated.
 2. Ceiling-Mounted Unit Spot-Detection Pattern: Full 360-degree conical.
 3. Ceiling-Mounted Unit Pattern Size: 84-inch diameter at floor level for units mounted 96 inches above floor; 18-foot diameter at floor level for units mounted 25 feet above floor.
- C. Device Performance:
1. Sensitivity: Adjustable pattern coverage to detect a change in temperature of 2 deg F or less, and standard-intruder movement within sensor's detection patterns at any speed between 0.3 to 7.5 fps across two adjacent segments of detector's field of view.
 2. Test Indicator: LED test indicator that is not visible during normal operation. When visible, indicator shall light when sensor detects an intruder. Locate test enabling switch under sensor housing cover.
 3. Remote Test: When initiated by master control unit, start a test sequence for each detector element that simulates standard-intruder movement within sensor's detection patterns, causing an alarm.

2.7 MICROWAVE INTRUSION DETECTORS (INTERIOR)

- A. Device Performance: Microwave transmitter establishes an electromagnetic field in an adjustable detection pattern and detects intrusion by monitoring changes in that pattern.
1. Sensitivity: Adjustable, able to detect standard-intruder movement within sensor's detection pattern at any speed between 0.3 to 7.5 fps. Sensor sensitivity adjustments shall be accessible only when sensor housing is removed, and sensors shall comply with 47 CFR 15.
 2. Activation Indicator: LED indicator shall not be visible during normal operation. Indicator shall light when sensor detects a standard intruder. Locate test-enabling switch under sensor housing cover.
 3. Remote Test: When initiated by master control unit, start a test sequence for each detector element that simulates standard-intruder movement within sensor's detection patterns, causing an alarm.

2.8 MICROWAVE-PIR DUAL-TECHNOLOGY SENSORS

- A. Description: Single unit combining a sensor that detects changes in microwave signals and a PIR sensor that detects changes in ambient level of infrared emissions caused by standard-intruder movement within detection pattern.

- B. Listed and labeled by a qualified testing agency for compliance with SIA PIR-01.
- C. Device Performance: An alarm is transmitted when either sensor detects a standard intruder within a period of three to eight seconds from when the other sensor detects a standard intruder.
 - 1. Minimum Detection Pattern: A room 20 by 30 feet.
 - 2. PIR Sensor Sensitivity: Adjustable pattern coverage to detect a change in temperature of 2 deg F or less, and standard-intruder movement within sensor's detection patterns at any speed between 0.3 to 7.5 fps across two adjacent segments of detector's field of view.
 - 3. Microwave Sensor Sensitivity: Adjustable, able to detect standard-intruder movement within sensor's detection pattern at any speed between 0.3 to 7.5 fps. Sensor sensitivity adjustments shall be accessible only when sensor housing is removed, and sensors shall comply with 47 CFR 15.
 - 4. Activation Indicator: LED indicator shall not be visible during normal operation. Indicator shall light when sensor detects a standard intruder. Locate test enabling switch under sensor housing cover.
 - 5. Remote Test: When initiated by master control unit, start a test sequence for each detector element that simulates standard-intruder movement within sensor's detection patterns, causing an alarm.

2.9 MASTER CONTROL UNIT

- A. Description: Existing.

2.10 AUDIBLE AND VISUAL ALARM DEVICES

- A. Bell: 10 inches in diameter, rated to produce a minimum sound output of 84 dB at 10 feet from master control unit.
 - 1. Enclosure: Weather-resistant steel box equipped with tamper switches on cover and on back of box.
- B. Klaxon Weatherproof Motor-Driven Hooter: UL listed, rated to produce a minimum sound output of 120 dB at 3 feet, plus or minus 3 dB, at a frequency of 470 Hz. Rated for intermittent use: two minutes on and five minutes off.
 - 1. Designed for use in industrial areas and in high-noise, severe-weather marine environments.
- C. Siren: 30-W speaker with siren driver, rated to produce a minimum sound output of 103 dB at 10 feet from master control unit.
 - 1. Enclosure: Weather-resistant steel box with tamper switches on cover and on back of box.

- D. Strobe: Xenon light complying with UL 1638, with a clear polycarbonate lens.
 - 1. Light Output: 115 cd, minimum.
 - 2. Flash Rate: 60 per minute.

2.11 SECURITY FASTENERS

- A. Operable only by tools produced for use on specific type of fastener by fastener manufacturer or other licensed fabricator. Drive system type, head style, material, and protective coating as required for assembly, installation, and strength.
- B. Drive System Types: pinned Torx or pinned hex (Allen).
- C. Socket Flat Countersunk Head Fasteners:
 - 1. Heat-treated alloy steel, ASTM F835.
 - 2. Stainless steel, ASTM F879, Group 1 CW.
- D. Socket Button Head Fasteners:
 - 1. Heat-treated alloy steel, ASTM F835.
 - 2. Stainless steel, ASTM F879, Group 1 CW.
- E. Socket Head Cap Fasteners:
 - 1. Heat-treated alloy steel, ASTM A574.
 - 2. Stainless steel, ASTM F837, Group 1 CW.
- F. Protective Coatings for Heat-Treated Alloy Steel:
 - 1. Zinc chromate, ASTM F1135, Grade 3 or Grade 4, for exterior applications and interior applications where indicated.
 - 2. Zinc phosphate with oil, ASTM F1137, Grade I, or black oxide unless otherwise indicated.

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 intrusion detection.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of intrusion detection connections before intrusion detection installation.

- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of intrusion detection.
- D. Inspect built-in and cast-in anchor installations, before installing intrusion detection, to verify that anchor installations comply with requirements. Prepare inspection reports.
 - 1. Remove and replace anchors where inspections indicate that they do not comply with requirements. Reinspect after repairs or replacements are made.
 - 2. Perform additional inspections to determine compliance of replaced or additional anchor installations. Prepare inspection reports.
- E. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SYSTEM INTEGRATION

- A. Integrate intrusion detection system with the following systems and equipment:
 - 1. Electronic door hardware.
 - 2. Elevators.
 - 3. Network lighting controls.
 - 4. Intercommunications and program systems.
 - 5. Public address and mass notification systems.
 - 6. Access control.
 - 7. Fire-alarm system.
 - 8. Perimeter security system.
 - 9. Video surveillance.

3.3 SYSTEM INSTALLATION

- A. Comply with UL 681 and NFPA 731.
- B. Equipment Mounting: Install master control unit on finished floor with tops of cabinets not more than 72 inches above the finished floor.
 - 1. Comply with requirements for seismic-restraint devices specified in Section 70548.16 "Seismic Controls for Communications Systems."
- C. Install wall-mounted equipment, with tops of cabinets not more than 72 inches above the finished floor.
 - 1. Comply with requirements for seismic-restraint devices specified in Section 270548.16 "Seismic Controls for Communications Systems."

- D. Connecting to Existing Equipment: Verify that existing perimeter security system is operational before making changes or connections.
 - 1. Connect new equipment to existing control panel in existing part of the building.
 - 2. Connect new equipment to existing monitoring equipment at the Supervising Station.
 - 3. Expand, modify, and supplement existing equipment as necessary to extend existing functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- E. Security Fasteners: Where accessible to inmates, install intrusion detection components using security fasteners with head style appropriate for fabrication requirements, strength, and finish of adjacent materials except that a maximum of two different sets of tools shall be required to operate security fasteners for Project. Provide stainless-steel security fasteners in stainless-steel materials.

3.4 WIRING INSTALLATION

- A. Wiring Method: Install wiring in metal raceways according to Section 270528 "Pathways for Communications Systems." Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.
- B. Wiring Method: Install wiring in metal raceways according to Section 270528 "Pathways for Communications Systems," except in accessible indoor ceiling spaces and in interior hollow gypsum board partitions where cable may be used. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.
- C. Wiring Method: Cable, concealed in accessible ceilings, walls, and floors when possible.
- D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- E. Wires and Cables:
 - 1. Conductors: Size as recommended in writing by system manufacturer unless otherwise indicated.

2. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.
 3. Control and Signal Transmission Conductors: Install unshielded, twisted-pair cable unless otherwise indicated or if manufacturer recommends shielded cable, according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
 4. Data and Television Signal Transmission Cables: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- F. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
- G. Install power supplies and other auxiliary components for detection devices at control units unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.
- H. Identify components with engraved, laminated-plastic or metal nameplate for master control unit and each terminal cabinet, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 270553 "Identification for Communications Systems."

3.5 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with identification requirements in Section 270553 "Identification for Communications Systems."
- B. Install instructions frame in a location visible from master control unit.

3.6 GROUNDING

- A. Ground the master control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to master control unit.
- B. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
- C. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding. Provide 5-ohm ground. Measure, record, and report ground resistance.
- D. Install grounding electrodes of type, size, location, and quantity indicated. Comply with installation requirements in Section 270526 "Grounding and Bonding for Communications Systems."

3.7 FIELD QUALITY CONTROL

- A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
 - 1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.
- B. Testing Agency: Engage qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- D. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- E. Tests and Inspections: Comply with provisions in NFPA 731, Ch. 9, "Testing and Inspections."
 - 1. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
 - 2. Test Methods: Intrusion detection systems and other systems and equipment that are associated with detection and accessory equipment shall be tested according to Table "Test Methods" and Table "Test Methods of Initiating Devices."
- F. Documentation: Comply with provisions in NFPA 731, Ch. 4, "Documentation."
- G. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.

3.8 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other-than-normal occupancy hours for this purpose. Visits for this purpose shall be in addition to any required by warranty.

3.9 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain the intrusion detection system. Comply with documentation provisions in NFPA 731, Ch. 4, "Documentation and User Training."

END OF SECTION 283100

SECTION 284621.11 - ADDRESSABLE FIRE-ALARM SYSTEMS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:

- 1. Existing addressable fire-alarm system to be modified.
 - 2. Existing fire-alarm control unit (FACU).
 - 3. System smoke detectors.
 - 4. Heat detectors.
 - 5. Fire-alarm notification appliances.

- B. Related Requirements:

- 1. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" or Section 260523 "Control Voltage Electrical Power Cables" for cables and conductors for fire-alarm systems.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.
- C. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the 2007 Energy Independence and Security Act (EISA).
- D. NICET: National Institute for Certification in Engineering Technologies.
- E. PC: Personal computer.
- F. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
 - 1. Control Voltage: Listed and labeled for use in remote-control, signaling, and power-limited circuits supplied by a Class 2 or Class 3 power supply having rated output not greater than 150 V and 5 A, allowing use of alternate wiring methods complying with CEC, Article 725.

2. Low Voltage: Listed and labeled for use in circuits supplied by a Class 1 or other power supply having rated output not greater than 1000 V, requiring use of wiring methods complying with CEC, Article 300, Part I.

1.4 SEQUENCING AND SCHEDULING

- A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational throughout the construction period in areas of the campus not being remodeled.
- B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.5 ACTION SUBMITTALS

- A. Approved Permit Submittal: Submittals must be approved by authorities having jurisdiction prior to submitting them to Architect.
- B. Product Data: For each type of product, including furnished options and accessories.
 1. Include construction details, material descriptions, dimensions, profiles, and finishes.
 2. Include rated capacities, operating characteristics, and electrical characteristics.
- C. Shop Drawings: For fire-alarm system.
 1. Comply with recommendations and requirements in "Documentation" section of "Fundamentals" chapter in NFPA 72.
 2. Include plans, elevations, sections, and details, including details of attachments to other Work.
 3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
 4. Detail assembly and support requirements.
 5. Include voltage drop calculations for notification-appliance circuits.
 6. Include battery-size calculations.
 7. Include input/output matrix.
 8. Include written statement from manufacturer that equipment and components have been tested as a system and comply with requirements in this Section and in NFPA 72.
 9. Include performance parameters and installation details for each detector.
 10. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
 11. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

- B. Qualification Statements: For Installer.
- C. Sample Warranty: Submittal must include line item pricing for replacement parts and labor.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Comply with "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - b. Provide "Fire-Alarm and Emergency Communications System Record of Completion Documents" in accordance with "Completion Documents" Article in "Documentation" section of "Fundamentals" chapter in NFPA 72 and deliver copies to the District Representative, Architect, fire official, and DSA.
 - c. Complete wiring diagrams showing connections between devices and equipment. Each conductor must be numbered at every junction point with indication of origination and termination points.
 - d. Riser diagram.
 - e. Device addresses.
 - f. Record copy of site-specific software.
 - g. Provide "Inspection and Testing Form" in accordance with "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
 - 1) Equipment tested.
 - 2) Frequency of testing of installed components.
 - 3) Frequency of inspection of installed components.
 - 4) Requirements and recommendations related to results of maintenance.
 - 5) Manufacturer's user training manuals.
 - h. Manufacturer's required maintenance related to system warranty requirements.
 - i. Abbreviated operating instructions for mounting at FACU and each annunciator unit.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
 - 2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
 - 3. Smoke Detectors, and Heat Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
 - 4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no

fewer than one unit of each type.

5. Audible and Visual Notification Appliances: One of each type installed.
6. Fuses: Two of each type installed in system. Provide in box or cabinet with compartments marked with fuse types and sizes.

1.9 QUALITY ASSURANCE

A. Installer Qualifications:

1. Personnel must be trained and certified by manufacturer for installation of units required for this Project.
2. Installation must be by personnel certified by NICET as fire-alarm Level II technician.
3. Obtain certification by NRTL in accordance with NFPA 72.
4. Licensed or certified by authorities having jurisdiction.

1.10 FIELD CONDITIONS

A. Seismic Conditions: Unless otherwise indicated on Contract Documents, specified Work in this Section must withstand the seismic hazard design loads determined in accordance with ASCE/SEI 7 for installed elevation above or below grade.

1. The term "withstand" means "unit must remain in place without separation of parts from unit when subjected to specified seismic design loads and unit must be fully operational after seismic event."

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail because of defects in materials or workmanship within specified warranty period.

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

PART 2 - PRODUCTS

2.1 EXISTING ADDRESSABLE FIRE-ALARM SYSTEM TO BE MODIFIED

A. Basis for Pricing: FCI/Gamewell "E3"-series..

B. Source Limitations for Fire-Alarm System and Components: Components must be compatible with, and operate as extension of, existing system. Provide system manufacturer's certification that components provided have been tested as, and will operate as, a system.

2.2 ADDRESSABLE FIRE-ALARM SYSTEM**A. Description:**

1. Noncoded, UL-certified addressable system, with multiplexed signal transmission and voice-and-strobe notification for evacuation.

B. Performance Criteria:

1. Regulatory Requirements:

- a. Fire-Alarm Components, Devices, and Accessories: Listed and labeled by a NRTL in accordance with CEC for use with selected fire-alarm system and marked for intended location and application.

2. General Characteristics:

- a. Automatic sensitivity control of certain smoke detectors.
- b. Fire-alarm signal initiation must be by one or more of the following devices:
 - 1) Manual stations.
 - 2) Heat detectors.
 - 3) Smoke detectors.
 - 4) Automatic sprinkler system water flow.
- c. Fire-alarm signal must initiate the following actions:
 - 1) Continuously operate alarm notification appliances, including voice evacuation notices.
 - 2) Identify alarm and specific initiating device at FACU.
 - 3) Transmit alarm signal to remote alarm receiving station.
 - 4) Activate voice/alarm communication system.
- d. Supervisory signal initiation must be by one or more of the following devices and actions:
 - 1) Zones or individual devices have been disabled.
 - 2) FACU has lost communication with network.
- e. System trouble signal initiation must be by one or more of the following devices and actions:
 - 1) Open circuits, shorts, and grounds in designated circuits.
 - 2) Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
 - 3) Loss of communication with addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.

2.3 SYSTEM SMOKE DETECTORS**A. Photoelectric Smoke Detectors:**

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. FCI.
2. Performance Criteria:
 - a. Regulatory Requirements:
 - 1) NFPA 72.
 - 2) UL 268.
 - b. General Characteristics:
 - 1) Detectors must be two-wire type.
 - 2) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
 - 3) Base Mounting: Detector and associated electronic components must be mounted in twist-lock module that connects to fixed base. Provide terminals in fixed base for connection to building wiring.
 - 4) Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
 - 5) Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
 - 6) Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.
 - 7) Operator at FACU, having designated access level, must be able to manually access the following for each detector:
 - a) Primary status.
 - b) Device type.
 - c) Present average value.
 - d) Present sensitivity selected.
 - e) Sensor range (normal, dirty, etc.).
 - 8) Detector must have functional humidity range within 10 to 90 percent relative humidity.
 - 9) Color: White.
 - 10) Remote Control: Unless otherwise indicated, detectors must be digital-addressable type, individually monitored at FACU for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by FACU.

2.4 HEAT DETECTORS

A. Combination-Type Heat Detectors:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. FCI.

2. Performance Criteria:
 - a. Regulatory Requirements:
 - 1) NFPA 72.
 - 2) UL 521.
 - b. General Characteristics:
 - 1) Temperature sensors must test for and communicate sensitivity range of device.
 - c. Actuated by fixed temperature of 135 deg F or rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
 - d. Mounting: Twist-lock base interchangeable with smoke-detector bases.
 - e. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
 - f. Detector must have functional humidity range of 10 to 90 percent relative humidity.
 - g. Color: White.

2.5 FIRE-ALARM NOTIFICATION APPLIANCES

A. Fire-Alarm Voice/Tone Notification Appliances:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. FCI.
2. Description: Notification appliances capable of outputting voice evacuation messages.
3. Performance Criteria:
 - a. Regulatory Requirements:
 - 1) NFPA 72.
 - 2) UL 1480.
 - b. General Characteristics:
 - 1) Speakers for Voice Notification: Locate speakers for voice notification to provide intelligibility requirements of "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
 - 2) High-Range Units: Rated 2 to 15 W.
 - 3) Low-Range Units: Rated 1 to 2 W.
 - 4) Mounting: Flush.
 - 5) Matching Transformers: Tap range matched to acoustical environment of speaker location.
 - 6) Combination Devices: Factory-integrated audible and visible devices in

single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Fire-Alarm Visible Notification Appliances:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. FCI.
2. Performance Criteria:
 - a. Regulatory Requirements:
 - 1) NFPA 72.
 - 2) UL 1971.
 - b. General Characteristics:
 - 1) Rated Light Output:
 - a) 15/30/75/110 cd, selectable in field.
 - 2) Clear or nominal white polycarbonate lens mounted on aluminum faceplate.
 - 3) Mounting: Wall mounted unless otherwise indicated.
 - 4) For units with guards to prevent physical damage, light output ratings must be determined with guards in place.
 - 5) Flashing must be in temporal pattern, synchronized with other units.
 - 6) Strobe Leads: Factory connected to screw terminals.
 - 7) Mounting Faceplate: Factory finished, red.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
 1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.
- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Preinstallation Testing: Perform verification of functionality of installed components of existing system prior to starting work. Document equipment or components not functioning as designed.
- B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service in accordance with requirements indicated:
 - 1. Notify Owner no fewer than fourteen (14) days in advance of proposed interruption of fire-alarm service.
 - 2. Do not proceed with interruption of fire-alarm service without Owner's written permission.
- C. Protection of In-Place Conditions: Protect devices during construction unless devices are placed in service to protect facility during construction.

3.3 INSTALLATION OF EQUIPMENT

- A. Comply with NECA 305, NFPA 72, CBC, CFC, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install electrical wiring to comply with requirements in CEC including, but not limited to, Article 760, "Fire Alarm Systems."
 - 1. Devices placed in service before other trades have completed cleanup must be replaced.
 - 2. Devices installed, but not yet placed, in service must be protected from construction dust, debris, dirt, moisture, and damage in accordance with manufacturer's written storage instructions.
- B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
 - 1. Connect new equipment to existing control panel in existing part of building.
 - 2. Expand, modify, and supplement existing control and monitoring equipment as necessary to extend existing control and monitoring functions to new points. New components must be capable of merging with existing configuration without degrading performance of either system.
- C. Smoke- and Heat-Detector Spacing:
 - 1. Comply with "Smoke-Sensing Fire Detectors" section in "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
 - 2. Comply with "Heat-Sensing Fire Detectors" section in "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
 - 3. Smooth ceiling spacing must not exceed 30 ft..
 - 4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas must be determined in accordance with Annex A or Annex B in NFPA 72.
 - 5. HVAC: Locate detectors not closer than 36 inch from air-supply diffuser or return-air opening.
 - 6. Lighting Fixtures: Locate detectors not closer than 12 inch from lighting fixture and not

directly above pendant mounted or indirect lighting.

- D. Install cover on each smoke detector that is not placed in service during construction. Cover must remain in place except during system testing. Remove cover prior to system turnover.
- E. Audible and Visible Alarm-Indicating Devices: Install per the elevations indicated on the drawings but not less than 6 inch below ceiling. Install speakers on flush-mounted back boxes with device-operating mechanism concealed behind grille. Install devices at same height unless otherwise indicated.

3.4 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with CEC and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

3.5 PATHWAYS

- A. Pathways must be installed in EMT.
- B. Exposed EMT must be painted red enamel.

3.6 CONNECTIONS

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.
 - 1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.
- B. Make addressable connections with supervised interface device to the following devices and systems. Install interface device less than 36 inch from device controlled. Make addressable confirmation connection when such feedback is available at device or system being controlled.
 - 1. Control modules for shutdown of HVAC units.

3.7 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for

identification specified in Section 270553 "Identification for Communications Systems."

- B. Install framed instructions in location visible from FACU.

3.8 FIELD QUALITY CONTROL

- A. Field tests must be witnessed by authorities having jurisdiction.
- B. Administrant for Tests and Inspections:
 - 1. Owner will engage qualified testing agency to administer and perform tests and inspections.
 - 2. Engage qualified testing agency to administer and perform tests and inspections.
 - 3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
 - 4. Administer and perform tests and inspections with assistance of factory-authorized service representative.
- C. Tests and Inspections:
 - 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection must be based on completed record Drawings and system documentation that is required by "Completion Documents, Preparation" table in "Documentation" section of "Fundamentals" chapter in NFPA 72.
 - b. Comply with "Visual Inspection Frequencies" table in "Inspection" section of "Inspection, Testing and Maintenance" chapter in NFPA 72; retain "Initial/Reacceptance" column and list only installed components.
 - 2. System Testing: Comply with "Test Methods" table in "Testing" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 3. Test audible appliances for public operating mode in accordance with manufacturer's written instructions. Perform test using portable sound-level meter complying with Type 2 requirements in ASA S1.4 Part 1/IEC 61672-1.
 - 4. Test audible appliances for private operating mode in accordance with manufacturer's written instructions.
 - 5. Test visible appliances for public operating mode in accordance with manufacturer's written instructions.
 - 6. Factory-authorized service representative must prepare "Fire Alarm System Record of Completion" in "Documentation" section of "Fundamentals" chapter in NFPA 72 and "Inspection and Testing Form" in "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
- D. Reacceptance Testing: Perform reacceptance testing to verify proper operation of added or replaced devices and appliances.
- E. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

- G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- H. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.9 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

3.10 MAINTENANCE

- A. Maintenance Service: Beginning at Substantial Completion, maintenance service must include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies must be manufacturer's authorized replacement parts and supplies.
 - 1. Include visual inspections in accordance with "Visual Inspection Frequencies" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 2. Perform tests in "Test Methods" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 3. Perform tests per "Testing Frequencies" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.11 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning at Substantial Completion, service agreement must include software support for two years.
- C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software must include operating system and new or revised licenses for using software.
 - 1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

END OF SECTION 284621.11

SECTION 31 10 00**SITE CLEARING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Protecting existing vegetation to remain.
 - 2. Removing existing vegetation.
 - 3. Clearing and grubbing.
 - 4. Stripping and stockpiling topsoil.
 - 5. Removing above- and below-grade site improvements.
 - 6. Disconnecting, capping or sealing, and removing site utilities or abandoning site utilities in place.
 - 7. Temporary erosion and sedimentation control.

1.3 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface and existing in-place surficial organic soil layer; the zone where plant roots grow.
- D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.

SITE CLEARING**31 10 00 - 1****DEHESA SCHOOL MODERNIZATION**

1.5 MATERIAL OWNERSHIP

- A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain District's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.7 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from District and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by District or authorities having jurisdiction.
 - 3. Maintain emergency vehicle access traffic ways at all times. If the Work impacts the emergency vehicle access traffic way, coordinate with the local Fire Marshal.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining District's property will be obtained by District before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by District Construction Manager.
- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store where indicated.
- D. Utility Locator Service: Retain a professional utility locator service and have all existing underground utilities located and surface-identified before site clearing.
- E. Do not commence site clearing operations until temporary erosion-control, sedimentation-control and plant-protection measures are in place.

- F. Tree- and Plant-Protection Zones: The following practices are prohibited within plant protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
 - 8. Do not direct vehicle or equipment exhaust toward protection zones.
 - 9. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.
- G. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.
- H. Burning: Burning is not permitted on the site.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation to remain. Wrap a 1-inch blue vinyl tie tape flag around each tree trunk at 54 inches above the ground.
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to District.

3.2 TREE AND PLANT PROTECTION

- A. Protect trees remaining on-site.
 - 1. Protect shrubs and other vegetation indicated to remain or be relocated.
 - 2. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by District Construction Manager.

3.3 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Coordinate with and follow all the requirements contained in Section 01 57 23 "Temporary Storm Water Pollution Control."
- C. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- D. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- E. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.4 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities.
 - 2. Protect all utilities to remain in place.
 - 3. Cap or seal utilities in accordance with the appropriate code and industry standard.
- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by District or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify District Construction Manager not less than five days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without District Construction Manager's written permission.

- C. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 02 41 16 "Structure Demolition" and Section 02 41 19 "Selective Demolition."

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
 - 3. Use only hand methods for grubbing within protection zones.
 - 4. Chip removed tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth indicated on drawings in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
 - 1. Limit height of topsoil stockpiles to 72 inches.
 - 2. Do not stockpile topsoil within protection zones.
 - 3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
 - 4. Stockpile surplus topsoil to allow for re-spreading deeper topsoil.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off District's property.
- B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 10 00

SECTION 31 20 00**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:

- 1. Excavating and filling for rough grading the Site.
- 2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, plants and synthetic turf surfacing.
- 3. Excavating and backfilling for buildings and structures.
- 4. Drainage course for concrete slabs-on-grade.
- 5. Subbase course for concrete walks and pavements.
- 6. Subbase course and base course for asphalt paving.
- 7. Subsurface drainage backfill for walls and trenches.
- 8. Excavating and backfilling trenches for utilities and pits for buried utility structures.

- B. Related Requirements:

- 1. Section 01 32 33 "Photographic Documentation".
- 2. Section 03 30 00 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
- 3. Section 31 10 00 "Site Clearing".
- 4. Section 32 84 00 "Planting Irrigation" for landscape irrigation trenching.
- 5. Section 32 92 00 "Turf and Grasses".

1.3 UNIT PRICES

- A. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.

- 1. 24 inches outside of concrete forms other than at footings.
- 2. 12 inches outside of concrete forms at footings.
- 3. 6 inches outside of minimum required dimensions of concrete cast against grade.
- 4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
- 5. 6 inches beneath bottom of concrete slabs-on-grade.
- 6. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

EARTH MOVING**31 20 00 - 1****DEHESA SCHOOL MODERNIZATION**

1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course, or the subgrade if there is no subbase course, and hot-mix asphalt paving or concrete paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course (Capillary Break): Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by District Construction Manager. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the work.
 - 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by District. Unauthorized excavation, as well as remedial work directed by District Construction Manager, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
 - 1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
 - 2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.

- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subbase Course: Aggregate layer placed between the subgrade and base course for asphalt or concrete pavement.
- K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase or base course if there is no subbase, drainage fill, drainage course, or topsoil materials.
- L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.5 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct pre-excavation conference at Project site.
 - 1. Review methods and procedures related to earthmoving, including:
 - a. Personnel and equipment needed to make progress and avoid delays.
 - b. Coordination of Work with utility locator service.
 - c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
 - d. Extent of trenching by hand or with air spade.
 - e. Field quality control.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Geotextiles.
 - 2. Warning tapes.
- B. Samples for Verification: For the following products, in sizes indicated below:
 - 1. Geotextile: 12-by-12 inches.
 - 2. Warning Tape: 12 inches long; of each color.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each borrow soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D 2487.

2. Laboratory compaction curve according to ASTM D 1557.

- C. Pre-excavation Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.8 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: The District will retain a DSA accepted testing agency according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.9 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from District and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by District or authorities having jurisdiction.
 3. Maintain emergency vehicle access traffic ways at all times. If the Work impacts the emergency vehicle access traffic way, coordinate with the local Fire Marshal.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining District's property will be obtained by the District before award of Contract.
1. Do not proceed with work on adjoining property until directed by the District Construction Manager.
- C. Utility Locator Service: Retain a professional utility locator service and have all existing underground utilities located and surface-identified before beginning earth-moving operations.
- D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 01 57 23 "Temporary Storm Water Pollution Control" and Section 31 10 00 "Site Clearing" are in place.
- E. Do not commence earth-moving operations until plant-protection measures are in place.
- F. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
 2. Parking vehicles or equipment.
 3. Foot traffic.
 4. Erection of sheds or structures.
 5. Impoundment of water.

6. Excavation or other digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.
- I. Existing Utilities: Do not interrupt utilities serving facilities occupied by District or others unless permitted in writing by District and then only after arranging to provide temporary utility services according to requirements indicated.
1. Notify District not less than five days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without District's written permission.
- J. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS**2.1 SOIL MATERIALS**

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, free of rock or gravel larger than 4 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
1. Expansion Index: Not more than 50 as measured by ASTM D 4829.
 2. Upper 18 inches of subgrade fill under landscaped areas: Soil containing not more than 10% stones or lumps larger than 1-1/2 inches.
- C. Unsatisfactory Soils: Soil Classification Groups OL, CH, MH, OH, and PT according to ASTM D 2487; Soil Classification Groups GC, SC, CL and ML where those soils are classified as medium or highly expansive by ASTM D 4829.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Backfill and Fill: Satisfactory soil materials.
- E. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

- F. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- H. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- I. Drainage Course (Capillary Break): Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.
- J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.
- K. Sand: ASTM C 33/C 33M; fine aggregate.
- L. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: As follows:
 - a. Grab Tensile Strength: 157 lbf; ASTM D 4632.
 - b. Sewn Seam Strength: 142 lbf; ASTM D 4632.
 - c. Tear Strength: 56 lbf; ASTM D 4533.
 - d. Puncture Strength: 65 lbf; ASTM D 4833.
 - 2. Apparent Opening Size: No. 70 sieve, maximum; ASTM D 4751.
 - 3. Permittivity: 1.8 per second, minimum; ASTM D 4491.
 - 4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: As follows:
 - a. Grab Tensile Strength: 247 lbf; ASTM D 4632.
 - b. Sewn Seam Strength: 222 lbf; ASTM D 4632.
 - c. Tear Strength: 90 lbf; ASTM D 4533.
 - d. Puncture Strength: 90 lbf; ASTM D 4833.
2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
3. Permittivity: 0.02 per second, minimum; ASTM D 4491.
4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
 1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
- B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Geotechnical Engineer. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
 - 1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - 2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the dimensions provided elsewhere in the Section.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing

and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. For the excavation of landscape irrigation trenches, see also Section 32 84 00 "Planting Irrigation."
- C. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
1. Clearance: 12 inches each side of pipe or conduit unless otherwise indicated.
- D. Trench Bottoms:
1. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

2. Unless indicated otherwise, excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
3. Unless indicated otherwise, excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3.8 SUBGRADE INSPECTION

- A. Notify Project Inspector when excavations have reached required subgrade. The Project Inspector will arrange for the District's Testing Agency to review the subgrade.
- B. If Testing Agency determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 1. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Testing Agency, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Testing Agency, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by District Construction Manager.
 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by District Construction Manager.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
 - 2. Obtain District's acceptance of stockpile locations prior to creation. If stockpile must be moved, obtain District's acceptance.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring, bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
 - 1. Unless otherwise indicated, provide pea gravel bedding for sanitary sewer and storm sewer piping.
 - 2. Clean sand may be used for bedding under piping other than sewer piping.
- C. Trenches under Footings: Unless otherwise indicated, backfill trenches excavated under footings and within the zone of influence of bottom of footings with concrete to elevation of bottom of footings. Concrete is specified in Section 03 30 00 "Cast-in-Place Concrete."
- D. Trenches under Roadways and Driveways: Unless otherwise indicated, provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below finished

surface of roadways or driveways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course (or base course if no subbase course is indicated.) Concrete is specified in Section 03 30 00 "Cast-in-Place Concrete."

- E. Backfill voids with satisfactory soil while removing shoring and bracing.
- F. Initial Backfill:
 - 1. Soil Backfill: Place and compact initial backfill of pea gravel or satisfactory soil, free of particles larger than 1-inch in any dimension, to a height of 12 inches over the pipe or conduit.
 - a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- G. Final Backfill:
 - 1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
- H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
- I. Coordinate backfilling with utilities testing.

3.13 SOIL FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. Place and compact fill material in layers to required elevations.
- D. Place soil fill on subgrades free of mud, frost, snow, or ice.
- E. All imported soil material shall be approved by Geotechnical Engineer prior to hauling on site.

3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent.
 3. Under turf or unpaved areas, compact per requirements of Section 32 91 13 "Soil Preparation".
 4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent, except for areas under structures, building slabs, pavements and walkways.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
 1. Turf or Unpaved Areas: Plus or minus 1-inch.
 2. Walks: Plus or minus 1-inch.
 3. Pavements: Plus or minus 1/2-inch.

- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2-inch when tested with a 10-foot straightedge.

3.17 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified in Section 33 46 00 "Subdrainage."
- B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. If indicated on drawings, overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

3.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 - 1. If subdrainage textile is indicated on drawings, install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 - 2. Place base course material under hot-mix asphalt pavement.
 - 3. Shape base course to required crown elevations and cross-slope grades.
 - 4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
 - 5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
 - 7. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.19 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 - 1. If subdrainage textile is indicated on drawings, install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 - 2. Place drainage course 6 inches or less in compacted thickness in a single layer.
 - 3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.20 FIELD QUALITY CONTROL

- A. Testing Agency: District will engage a qualified independent geotechnical engineering testing agency to perform tests and inspections.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Project Inspector.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
 - 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
 - 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 100 feet or less of trench length but no fewer than two tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.21 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Geotechnical Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off District's property.

END OF SECTION 31 20 00

**SECTION 32 12 16
ASPHALT PAVING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Reference Standards:
 - 1. Standard Specifications for the State of California, Department of Transportation (CalTrans Standard Specifications), current edition.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cold milling of existing asphalt pavement.
 - 2. Hot-mix asphalt patching.
 - 3. Hot-mix asphalt paving.
 - 4. Hot-mix asphalt overlay.
 - 5. Asphalt curbs.
 - 6. Asphalt traffic-calming devices.
 - 7. Asphalt surface treatments.
 - a. Seal Coats.
 - b. Crack Sealants.
- B. Related Requirements:
 - 1. Section 31 20 00 "Earth Moving" for subgrade preparation, fill material, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
 - 2. Section 32 13 73 "Concrete Paving Joint Sealants" for joint sealants and fillers at pavement terminations.

1.3 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the State.
 - 1. Standard Specification: CalTrans.
 - 2. Manual of Tests: CalTrans.
 - 3. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.4 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to hot-mix asphalt paving, including:
 - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include technical data and tested physical and performance properties.
 - 2. Job-Mix Designs: For each job mix proposed for the Work.
- B. Samples for Verification: For the following product, in manufacturer's standard sizes unless otherwise indicated:
 - 1. Paving Fabric: 12-by-12 inches minimum.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For each manufacturer.
- B. Material Certificates: For each paving material. Submit certificate for each paving material, signed by manufacturer certifying that each material complies with requirements. Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.
- C. Material Test Reports: For each paving material, by a qualified testing agency.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by the California Department of Transportation (CalTrans).
- B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the California Department of Transportation (CalTrans) for asphalt paving work.
 - 1. Comply with requirements of local jurisdictions where more stringent than CalTrans requirements.
 - 2. Measurement and payment provisions and safety program submittals included in CalTrans standard specifications do not apply to this Section.

3. Comply with the applicable standards of the San Diego County Air Pollution Control District for quantities of volatile organic compounds (VOC's) used in all materials.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 1. Tack Coat: Minimum surface temperature of 60 deg F.
 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
 4. Seal coat: At time of placement, minimum ambient temperature 55 deg F, minimum surface temperature 60 deg F.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Base Coarse Aggregate: Class 2 Aggregate Base mineral aggregate, 3/4-inch maximum size, as specified in CalTrans Standard Specifications.
- C. Asphalt Aggregate: Type B Aggregate, as specified in CalTrans Standard Specifications.
 1. 3/4-inch maximum size for base course.
 2. 1/2-inch maximum size for surface course.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: Steam Refined, material. PG 64-10 conforming to CalTrans Standard Specifications.
- B. Tack Coat: ASTM D 977 emulsified asphalt, or ASTM D 2397 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- C. Seal Coat: Emulsified asphalt with a minimum 2 percent to 3 percent latex or copolymer added with 2 to 4 lbs of grade #30 silica sand added per gallon and mechanically agitated.
- D. Water: Potable.

2.3 AUXILIARY MATERIALS

- A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.
- B. Herbicide: Commercial chemical for weed control, registered by the Environmental Protection Agency (EPA), and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.
- C. Sand: ASTM D 1073 or AASHTO M 29, Grade No. 2 or No. 3.
- D. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.
- E. Crack Sealer: Rubberized joint sealant complying with Federal Standards ASTM D 5329 Parking Lot Crack Sealer.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:
 - 1. Comply with CalTrans Standard Specifications.
 - 2. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
- B. Base Course: Comply with CalTrans Standard Specifications.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Ensure that any air handling system that is likely to ingest fumes is protected and that windows near paving operations are closed.
- B. Verify that subgrade is dry and in suitable condition to begin paving.
- C. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 - 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Geotechnical Testing Agency, and replace with compacted backfill or fill as directed.
- D. Notify District Construction Manager in writing of any unsatisfactory conditions. Proceed with paving only after unsatisfactory conditions have been corrected.
- E. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

3.2 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
 - 1. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
 - 2. Control rate of milling to prevent tearing of existing asphalt course.
 - 3. Repair or replace curbs, manholes, and other construction damaged during cold milling.
 - 4. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
 - 5. Handle milled asphalt material according to approved waste management plan.
 - 6. Keep milled pavement surface free of loose material and dust.
 - 7. Do not allow milled materials to accumulate on-site.

3.3 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Scarify and recompact the upper 12 inches of subgrade to 95% of maximum density. Excavate rectangular or trapezoidal patches, extending 12 inches

into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
 - 1. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd.
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Patching, Single Asphalt Course: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.
- E. Patching, Separate Asphalt Courses: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.4 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1-inch in existing pavements.
 - 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4-inch.
 - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
 - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4-inch wide. Fill flush with surface of existing pavement and remove excess.
 - 3. Use hot-applied joint sealant to seal cracks and joints more than 1/4-inch wide. Fill flush with surface of existing pavement and remove excess.

3.5 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.6 PAVING GEOTEXTILE INSTALLATION

- A. Apply asphalt binder / cement, consisting of solvent-free emulsified asphalt, uniformly to existing pavement surfaces at a rate of 0.20 to 0.30 gal./sq. yd.
- B. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches and transverse joints 6 inches.
- C. Protect paving geotextile from traffic and other damage, and place hot-mix asphalt overlay the same day.

3.7 PLACING BASE COURSE

- A. Install paving geotextile on prepared subgrade or subbase according to manufacturer's written instructions, overlapping sides and ends.
- B. Place base course as follows:
 - 1. Compact base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
 - 2. Shape base to required crown elevations and cross-slope grades.
 - 3. When thickness of compacted base course is 6 inches or less, place materials in a single layer.

4. When thickness of compacted base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches or less than 3 inches thick when compacted.

3.8 PLACING HOT-MIX ASPHALT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 1. When thickness of asphalt course is 4 inches or less, place materials in a single layer.
 2. When thickness of asphalt course exceeds 4 inches, place material in equal layers, with no layer more than 4 inches or less than 2 inches thick when compacted.
 3. Spread mix at a minimum temperature of 250 deg F.
 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.9 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 1. Clean contact surfaces and apply tack coat to joints.
 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.

6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.10 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Use a vibratory roller with dynamic force of 93,000 lbs, or weighing 21,000 lbs. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and rerolling to required elevations. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 1. Average Density (Marshall Test Method): 96 percent of reference laboratory density according to ASTM D 6927 or AASHTO T 245, but not less than 94 percent or greater than 100 percent.
 2. Average Density (Rice Test Method): 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.11 ASPHALT CURBS

- A. Construct hot-mix asphalt curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust. Spread mix at a minimum temperature of 250 deg F.
 - 1. Asphalt Mix: Same as pavement surface-course mix.
- B. Place hot-mix asphalt to curb cross section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.12 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/2-inch.
 - 2. Surface Course: Plus 1/4-inch, no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: 1/4-inch.
 - 2. Surface Course: 1/8-inch.
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4-inch.

3.13 CRACK REPAIR

- A. Remove vegetation and treat with herbicide.
- B. Rout cracks in accordance with SHRP H348 and H349.
- C. Fill cracks with hot-applied joint sealant. Apply with a wand from a double jacketed melter.
 - 1. Over-fill cracks and squeegee level with pavement

3.14 SURFACE TREATMENTS

- A. Seal Coat: Apply first coat at rate of 0.125 to 0.185 gal./sq. yd. After first coat has dried, apply second coat at rate of 0.100 to 0.185 gal./sq. yd.
 - 1. Seal coating new pavements should be delayed 30 days after installation or as recommended by manufacturer.

2. Preparation: All area shall be power-swept, vacuumed and cleared of loose material.
3. Standing water shall be spread out and allowed to dry. Do not apply seal coat to wet or damp surfaces.
4. Oil spots shall be manually scraped and cleaned with a mild detergent. Apply primer over highly saturated petroleum areas.
5. Cover and protect items within paved area that are not to be coated, such as valve boxes, manholes and concrete.

3.15 FIELD QUALITY CONTROL

- A. Testing Agency: District will engage a qualified testing agency to perform tests and inspections and to prepare test reports.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. Asphalt Speed Bumps: Finished height of traffic-calming devices above pavement will be measured for compliance with tolerances.
- E. Replace and compact hot-mix asphalt where core tests were taken.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.16 WASTE HANDLING

- A. General: Handle asphalt-paving waste according to approved waste management plan.
- B. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
 1. Do not allow milled materials to accumulate on-site.

END OF SECTION 32 12 16

**SECTION 32 13 13
CONCRETE PAVING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes Concrete Paving including the following:
 - 1. Driveways.
 - 2. Roadways.
 - 3. Parking lots.
 - 4. Curbs and gutters.
 - 5. Walks.
- B. Related Requirements:
 - 1. Section 32 13 73 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to concrete paving, including:
 - a. Concrete mixture design.
 - b. Quality control of concrete materials and concrete paving construction practices.
 - 2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:

- a. Contractor's superintendent.
- b. Independent testing agency responsible for concrete design mixtures.
- c. Concrete paving Subcontractor.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixes: For each concrete paving mix. Include alternate design mixes when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 1. Mix designs are subject to approval of the District's testing laboratory of record for compliance with requirements.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Certificates: For the following, from manufacturer:
 1. Cementitious materials.
 2. Steel reinforcement and reinforcement accessories.
 3. Fiber reinforcement.
 4. Admixtures.
 5. Curing compounds.
 6. Applied finish materials.
 7. Bonding agent or epoxy adhesive.
 8. Joint fillers.

1.7 REGULATORY REQUIREMENTS

- A. Portland cement concrete paving & concrete finishes:
 1. Portland cement concrete paving shall be stable, firm, and slip resistant and shall comply with *CBC Sections 11B-302 and 11B-403*.

1.8 QUALITY ASSURANCE

- A. Codes and Standards: Comply with local governing regulations if more stringent than herein specified.
- B. Comply with applicable provisions of the following, except as otherwise indicated:
 1. Applicable portions of the CBC.

2. The U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities.
 3. Conform to applicable City codes for paving work on public property.
- C. Continuous surfaces, including walks and sidewalks, shall have a continuous common surface, not interrupted by abrupt changes in level exceeding 1/2-inch
- D. All concrete paving with a slope less than 5 percent shall have a medium broom finish, and all concrete paving with a slope equal to or greater than 5 percent shall have a slip resistant heavy broom finish.
- E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.
- F. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.
- G. Concrete Testing Service: Engage a qualified independent testing agency to design concrete mixes.
1. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 2. Qualification requirements are in addition to those specified in Section 01 40 02 "Quality Requirements / Contractor Laboratory."

1.9 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS**2.1 CONCRETE, GENERAL**

- A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
 - 1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, fabricated from as-drawn steel wire into flat sheets.
- B. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.
- C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- D. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.
- E. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.
- F. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 deformed bars; assembled with clips.
- G. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.
- H. Deformed-Steel Wire: ASTM A 1064/A 1064M.
- I. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A; coated, plain.
- J. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 plain-steel bars.
- K. Tie Bars: ASTM A 615/A 615M, Grade 60; deformed.

- L. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- M. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, precast concrete, or fiber-reinforced concrete of greater compressive strength than concrete specified, and as follows:
- N. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.
- O. Zinc Repair Material: ASTM A 780/A 780M.

2.4 CONCRETE MATERIALS

- A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:
 - 1. Portland Cement: ASTM C 150/C 150M, gray Portland cement Type II Type V, low alkali.
 - 2. Fly Ash: ASTM C 618, Class N or Class F.
- B. Aggregate: ASTM C 33/C 33M, uniformly graded, from a single source.
 - 1. Fine Aggregate: Minimum sand equivalent (ASTM D 2419) is 80.
 - 2. Coarse Aggregate: Minimum cleanness value (CalTrans Test cv 227) is 80.
- C. Water: Potable and complying with ASTM C 94/C 94M.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260/C 260M.
- B. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
- C. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
- E. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
- F. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.

- G. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Davis Colors.
 - b. Scofield, L. M. Company.
 - c. SureCrete Design Products.
 - d. Or Equal.
 - 2. Color: As selected by Architect from manufacturer's full range.

2.6 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ChemMasters, Inc.
 - b. Euclid Chemical Company (The); an RPM company.
 - c. L&M Construction Chemicals, Inc.
 - d. Or Equal.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ChemMasters, Inc.
 - b. Dayton Superior.
 - c. L&M Construction Chemicals, Inc.
 - d. Or Equal.

2.7 RELATED MATERIALS

- A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy-Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8- to 1/4-inch.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ChemMasters, Inc.
 - b. Scofield, L. M. Company.
 - c. Sika Corporation.
 - d. Or Equal.

2.8 CONCRETE MIXES

- A. Prepare design mixtures, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience. Mix designs are subject to approval of the District's testing laboratory.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method. Do not use District's field quality control testing agency for this purpose.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
 - 1. Fly Ash or Pozzolan: 15 percent.

- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content of 2.0 to 4.0 percent.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
- F. Concrete Mixtures: Normal-weight concrete.
 - 1. Compressive Strength (28 Days): 4000 psi.
 - 2. Maximum W/C Ratio at Point of Placement: 0.50.
 - 3. Slump Limit: 4 inches.
 - a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches after adding admixture to plant- or site-verified 2- to 3-inch slump.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.
 - 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.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For concrete batches of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

3.2 PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
 - 2. Provide tie bars at sides of paving strips where indicated.
 - 3. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
 - 1. Locate expansion joints at maximum intervals of 50 feet unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler not less than 1/2-inch or more than 1-inch below finished surface if joint sealant is indicated.
 - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 - 6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Control Joints: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
 - 1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of control joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.

- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with requirements and with recommendations of ACI 301 for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels and joint devices.
- H. Screed paving surface with a straightedge and strike off.
- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- J. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing. If results are not approved, remove and replace with formed concrete.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
 - 2. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16- to 1/8-inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 SPECIAL FINISHES

- A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:
 - 1. Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
 - 2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
 - 3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
 - 4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- B. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:
 - 1. Uniformly spread 25 lb/100 sq. ft. of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
 - 2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.
 - 3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
 - 4. After curing, lightly work surface with a steel-wire brush or abrasive stone and water to expose nonslip aggregate.

3.9 DETECTABLE WARNING INSTALLATION

- A. Blockouts: Form blockouts in concrete for installation of detectable paving units specified in Section 32 17 26 "Tactile Warning Surfacing."
 - 1. Tolerance for Opening Size: Plus 1/4-inch, no minus.
- B. Cast-in-Place Detectable Warning Tiles: Form blockouts in concrete for installation of tiles specified in Section 32 17 26 "Tactile Warning Surfacing." Screed surface of concrete where tiles are to be installed to elevation, so that edges of installed tiles will be flush with surrounding concrete paving. Embed tiles in fresh concrete to comply with Section 32 17 26 "Tactile Warning Surfacing" immediately after screeding concrete surface.

3.10 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive hot temperatures.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound where allowed, or a combination of these, as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
 - 3. Curing Compound (Allowed only where other materials will not be applied over concrete): Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy

rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.11 PAVING TOLERANCES

- A. Construction tolerances do not override requirement to comply with disabled accessibility regulations.
- B. Comply with tolerances in ACI 117 and as follows:
 - 1. Elevation: 1/4-inch.
 - 2. Thickness: Plus 3/8-inch, minus 1/4-inch.
 - 3. Surface: Gap below 10 feet-long; unleveled straightedge not to exceed 1/4-inch.
 - 4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2-inch per 12 inches of tie bar.
 - 5. Lateral Alignment and Spacing of Dowels: 1-inch.
 - 6. Vertical Alignment of Dowels: 1/4-inch.
 - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4-inch per 12 inches of dowel.
 - 8. Joint Spacing: 3 inches.
 - 9. Contraction Joint Depth: Plus 1/4-inch, no minus.
 - 10. Joint Width: Plus 1/8-inch, no minus.

3.12 FIELD QUALITY CONTROL

- A. Testing Agency: District will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Testing Services: Testing will be performed according to the following requirements:
 - 1. Sampling Fresh Concrete: Representative samples of fresh concrete will be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
 - 2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
 - 3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
 - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive-strength specimens.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; one set of three standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders will be molded and stored for laboratory-cured test specimens.

6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. One specimen will be tested at 7 days and two specimens at 28 days.
- C. Test results will be reported in writing to Architect, Project Inspector, District Construction Manager, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests will contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- D. Additional Tests: Testing and inspecting agency will 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 the District Construction Manager.
- E. Concrete paving will be considered defective if it does not pass tests and inspections.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.13 REPAIR AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by District Construction Manager.
- B. Drill test cores where directed by District Construction Manager, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with Portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

SECTION 32 13 73
CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Expansion and contraction joints within Portland cement concrete pavement.
 - 2. Cold-applied joint sealants.
 - 3. Joint-sealant backer materials.
 - 4. Primers.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of joint sealant and accessory.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 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.

PART 2 - PRODUCTS**2.1 MATERIALS, GENERAL**

- A. Compatibility: Provide joint sealants, backing materials, 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 for this characteristic.

2.2 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Nonsag, Low-Modulus, Neutral-Curing, Silicone Joint Sealant for Concrete: ASTM D 5893/D 5893M, Type NS.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Roadsaver Silicone-SL; Crafco Inc.
 - b. 888; Dow Corning Corporation.
 - c. Pecora Corporation.
 - d. Or Equal.
- B. Multicomponent, Pourable, Urethane, Chemically Curing Elastomeric Formulation Jet-Fuel-Resistant Joint Sealant for Concrete: ASTM C 920; Type M; Grade P; Class 12-1/2; for Uses T, M, and, as applicable to joint substrates indicated, O.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Vulkem 202; Mameco International.
 - b. Urexpam NR-300; Pecora Corporation.
 - c. Sealtight Gardox; W. R. Meadows, Inc.
 - d. Or Equal.

2.3 JOINT-SEALANT BACKER MATERIALS

- A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.
- B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

- C. Backer Strips for Cold-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.4 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-installation joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

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.
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on pre-installation joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

- A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.
- C. Install joint-sealant backings to support joint 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 joint-sealant backings.

2. Do not stretch, twist, puncture, or tear joint-sealant backings.
 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:
1. Place joint sealants so they fully contact 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.
- E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements 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 joint sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.
- 3.4 **CLEANING AND PROTECTION**
- A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.
- B. 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 and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION 32 13 73

**SECTION 32 17 23
PAVEMENT MARKINGS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes painted markings applied to asphalt pavement for Passenger Drop-off and Loading Zones..
- B. Related Requirements:
 - 1. Section 09 91 13 "Exterior Painting" for painting exterior concrete surfaces other than pavement.

1.3 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site a minimum of two weeks prior to the start of Work in this Section:
 - 1. Review methods and procedures related to marking pavement, including:
 - a. Pavement aging period before application of pavement markings.
 - b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include technical data and tested physical and performance properties. Retain paragraph below if playground markings are included in the project. Coordinate with "Playground Markings" Paragraph.
- B. Shop Drawings: For playground markings.
 - 1. Indicate playground markings, colors, and dimensions.

1.5 REGULATORY REQUIREMENTS

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of CBC Title 24 for pavement-marking work.
- B. Comply with California Building Code (CBC) current edition
 - 1. For Passenger Drop-off and Loading Zones CBC Sections 11B-209 and 11B-503 as follows:
 - a) At least one passenger loading zone shall be provided in every continuous 100 lineal feet of loading zone space or fraction thereof complying with the above two Sections as follows:
 - Vehicle pull-up space shall be 8'X20' minimum
 - Access aisles shall be 5" wide minimum x full length of vehicle pull-up spaces they serve and shall be adjacent and parallel to the vehicle pull-up spaces. They shall be at the same level with each other and with slopes not steeper than 1:48 in any direction. Access aisle shall adjoin an accessible route and shall not overlap the vehicular way.
 - Access aisles for passenger drop-off and loading zone shall be marked with a painted borderline around their perimeter. The area within the borderlines shall be marked with hatched lines a maximum of 36" on center a color contrasting with that of the aisle surface. Blue perimeter lines with blue interior hatch lines are preferred for concrete surfaces and blue perimeter lines with white interior hatch lines are preferred for asphalt surfaces.
 - CBC Section 11B-503.3.3: A vertical clearance of 9'-6" minimum shall be provided for vehicle pull-up spaces, access aisles and a vehicular route serving them connecting a vehicular entrance and a vehicular exit.
 - 2. Bus loading zones and bus stops shall comply with CBC Sections 11B-209 and 11B-810.2 as follows:
 - a) •Bus boarding and alighting areas shall be of 8' x 5' minimum, with 8' measured perpendicular to the curb or vehicle roadway edge, and with 5' measured parallel to the vehicle roadway. Slopes in 8' direction shall be 1:48 maximum. Slopes in 5' direction shall be the same as that of the roadway, to the maximum extent practicable. CBC Figure 11B-810.2.2.

1.6 PLAYGROUND MARKINGS

- A. Where existing playground markings will be disrupted by the Work of this project, survey, photograph and record all existing markings, and replace them in their original configuration, location and color unless otherwise indicated.
- B. Where new playground markings are to be provided, locate and configure as shown in the Drawings.]

SPECIFICATIONS

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1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by the manufacturer. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for alkyd materials and 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Dunn-Edwards Corporation.
 - 2. Frazee Paint; Comex Group.
 - 3. Sherwin-Williams Company (The).

2.2 PAVEMENT-MARKING PAINT

- A. Pavement-Marking Paint: Alkyd traffic-marking paint.
 - 1. Color: As indicated .
- B. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952E, Type II, with drying time of less than 45 minutes.
 - 1. Color: As indicated

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with the District Project Manager and District Construction Manager.
- B. Allow paving to age for a minimum of 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
 - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.

3.3 PROTECTING AND CLEANING

- A. Protect pavement markings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 32 17 23

SECTION 32 17 26
TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cast-in-place detectable warning tiles.
- B. Related Requirements:
 - 1. Section 32 13 13 "Concrete Paving" for concrete walkways serving as substrates for tactile warning tiles .

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each type of tactile warning surface, in manufacturer's standard sizes unless otherwise indicated, showing edge condition, truncated-dome pattern, texture, color, and cross section; with fasteners and anchors.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For tactile warning surfacing, to include in maintenance manuals.

1.5 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) current edition
- B. Detectable Warning surfaces shall comply with CBC Section 11B-705.1.
 - 1. Detectable warning surfaces at transit boarding platform edges, bus stops, hazardous vehicular areas, reflecting pools and track crossings shall be yellow and approximate to Federal Standard FS 33538 of SAE AMS-STD-595A. The material

used to provide visual contrast shall be an integral part of the surface. CBC Section 11B-705.1.1.3

2. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound on cane contact. Such constraint shall not be required for detectable warning surfaces at curb ramps, islands or cut-through medians. CBC Section 11B-705.1.1.4.

1.6 QUALITY ASSURANCE

- A. Surface-applied detectable warning tiles or mats are not permitted.
- B. Tactile Warning Surfacing shall have a coefficient of friction of 0.6 minimum when tested in accordance with ASTM C 1028.

1.7 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Mortar and Grout:
 1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Provide artificial shade and windbreaks, and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and higher.
 - a. When ambient temperature exceeds 100 deg F, or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F, set unit pavers within 1 minute of spreading setting-bed mortar.

1.8 WARRANTY

- A. Manufacturer's certification that indicates compliance with the architectural access standards as published in the current edition of the CBC.
- B. Special Warranty: Manufacturer agrees to repair or replace components of tactile warning surfaces that fail in materials or workmanship within specified warranty period.
 1. Failures include:
 - a. Deterioration of finishes beyond normal weathering and wear.
 - b. Deterioration of durability criteria as listed below.
 - c. Separation or delamination of materials and components.

2. Warranty Period: Provide a minimum five year warranty from date of Substantial Completion of durability criteria, including shape, color fastness, confirmation, sound-on-cane acoustic quality, resilience and attachment, per DSA Bulletin 10/31/02 revised 4/9/08.

PART 2 - PRODUCTS

2.1 TACTILE WARNING SURFACING, GENERAL

- A. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities, and the CBC for tactile warning surfaces.
 1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.
- B. Source Limitations: Obtain each type of tactile warning surfacing, joint material, setting material, anchor, and fasteners from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 DETECTABLE WARNING TILES

- A. Cast-in-Place Detectable Warning Tiles: Accessible truncated-dome detectable warning tiles surface configured for setting flush in new concrete walkway surfaces, with slip-resistant surface treatment on domes and field of tile.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armorcast Products Company.
 - b. Detectable Warning Systems, Inc.
 - c. StrongGo Industries, LLC.
 - d. Or Equal.
 2. Material: Cast-fiber-reinforced polymer concrete tile.
 3. Color: Safety yellow.
 - a. Color No. 33538 per ASMS-STD-595A.
 - b. Color must be integral throughout the tile and not surface applied.
 4. Sizes:
 - a. Rectangular panel, as indicated.
 5. Dome Spacing and Configuration: as indicated.

- a. 2.35-inch center-to-center spacing in all directions and across adjacent tiles.
 - b. Round truncated dome configuration, 0.9" (22 mm) diameter at base and 0.45" (11 mm) diameter at top.
 - c. Truncated dome height: 0.2" (5 mm).
 - d. Layout: Square layout within the tile and square to the direction of travel.
6. Mounting:
 - a. Permanently embedded detectable warning tile wet-set into freshly poured concrete.
 - b. Detectable warning tile set into formed recess in concrete and adhered with mortar.
 - c. Replaceable detectable warning tile wet-set into freshly poured concrete and surface-fastened to permanently embedded anchors.
7. Mortar Setting Bed
 - a. Portland Cement: ASTM C 150/C 150M, type I or Type II
 - b. Sand: ASTM C 33/C 33M
 - c. Latex Additive; Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed Portland cement and aggregate mortar bed, and not containing a retarder.
 - d. Thinset Mortar: Latex-modified Portland cement mortar complying with ANSI A118.4.
 - e. Water: Potable

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF TACTILE WARNING SURFACING

- A. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.
- B. Place tactile warning surfacing units in dimensions and orientation indicated.
- C. Provide expansion joints around perimeter of precast concrete tiles and at 8' on center maximum in both directions.

- D. Installation must comply with the architectural access standards as published in the current edition of the CBC.

3.3 INSTALLATION OF DETECTABLE WARNING TILES

A. Cast-in-Place Detectable Warning Tiles:

1. Concrete Paving Installation: Comply with installation requirements in Section 32 13 13 "Concrete Paving." Mix, place, and finish concrete to conditions complying with detectable warning tile manufacturer's written requirements for satisfactory embedment of tile.
2. Set each detectable warning tile accurately and firmly in place and completely seat tile back and embedments in wet concrete by tamping or vibrating. If necessary, temporarily apply weight to tiles to ensure full contact with concrete.
3. Set surface of tile flush with surrounding concrete and adjacent tiles, with variations between tiles and between concrete and tiles not exceeding plus or minus 1/8-inch from flush.
4. Protect exposed surfaces of installed tiles from contact with wet concrete. Complete finishing of concrete paving surrounding tiles. Remove concrete from tile surfaces.
5. Clean tiles using methods recommended in writing by manufacturer.

3.4 CLEANING AND PROTECTION

- A. Remove and replace tactile warning surfacing that is broken or damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint. Replace using tactile warning surfacing installation methods acceptable to District Construction Manager.
- B. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

END OF SECTION 32 17 26

SECTION 32 31 13
CHAIN LINK FENCES AND GATES

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Chain-link fences.
 - 2. Swing gates.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for concrete.
 - 2. Section 08 71 00 "Door Hardware" for gate hardware

1.3 COORDINATION

- A. Coordinate gate hardware to comply with single source manufacturer requirement specified in section 08 71 00 Door Hardware.

1.4 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site a minimum of two weeks before Work in this Section is to commence.
 - 1. Review required testing, inspecting, and certifying procedures.
 - 2. Review fence and gate layouts

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 the following:

- a. Fence and gate posts, rails, and fittings.
 - b. Chain-link fabric, reinforcements, and attachments.
 - c. Accessories.
 - d. Gates and hardware.
- B. Shop Drawings: For each type of fence and gate assembly.
 - 1. Include plans, elevations, sections, details, and attachments to other work. Show locations of gates, posts, rails, and tension wires, and details of gate swing, or other operation, hardware, and accessories.
 - 2. Indicate materials, dimensions, sizes, weights, and finishes of components.
 - 3. Include accessories, hardware, gate operation, and operational clearances.
- C. Samples for Initial Selection: For each type of factory-applied finish.
- D. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:
 - 1. Galvanized steel: In 6-inch lengths for components and on full-sized units for accessories.]

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Certificates: For each type of chain-link fence and gate.
- C. Product Test Reports: For framework strength according to ASTM F 1043, for tests performed by a qualified testing agency.
- D. Field quality-control reports.
- E. Sample Warranty: For special warranty.

1.7 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) 2022 edition.
- B. Fences, Gates, and Hardware:
 - 1. Gates that are part of the accessible route shall meet all the requirements of an accessible door in compliance with CBC Section 11B-404.
 - 2. The levers of lever actuated latches or locks for accessible gates shall be curved with a return to within 1/2 inch of the gate surfaces to prevent catching on the clothing or persons. California Referenced Standards Code: T-24 Part 12, Section 12-10-202, Item F.

- C. Swing doors and gate surfaces within 10" of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16 inch of the same plane as the other and free of sharp or abrasive edges. Cavities created by added kick plates shall be capped. CBC Section 11B-404.2.10.
- D. Emergency Exit and Panic Hardware: Comply with SFM Standard 12-10-3, section 12-10-302.
 - 1. The cross-bar shall extend across not less than one-half the width of the door/gate.
 - 2. The ends of the cross-bar shall be curved, guarded or otherwise designed to prevent catching on the clothing of persons during egress.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing fence grounding; member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- B. Emergency Access Requirements: Comply with requirements of the Division of the State Architect (DSA) for gates serving as a required means of access.
- C. Post and rail piping shall not be installed until the Project Inspector verifies that the material meets the specified weight per lineal foot for each pipe size to be used.
- D. Post footing excavations shall be approved by the Project Inspector prior to setting any posts.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements. Match existing fence heights where continuing or extending existing fence enclosure/s.

1.10 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
 - 1. Failures include:
 - a. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

- b. Fabric bowing, sagging, breakage or similar defects.
 - c. Fence framework failure.
 - d. Faulty operation of gate hardware
 - e. Faulty layout of fence and gate/s..
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Lightning Protection System: Maximum resistance-to-ground value of 25 ohms at each grounding location along fence under normal dry conditions.

2.2 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
- 1. Fabric Height: As indicated on Drawings.
 - 2. Steel Wire for Fabric: Wire diameter of 0.148-inch.
 - a. Mesh Size:
 - 1) Standard Fence Fabric: 2 inches.
 - b. Zinc-Coated Fabric: ASTM A 392, Type II, Class 2, 2.0 oz./sq. ft. with zinc coating applied after weaving.
 - 3. Selvage: Knuckled at both selvages.

2.3 FENCE FRAMEWORK

- A. Posts and Rails: ASTM F 1043 for framework, including rails, braces, and line; terminal; gate; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 or ASTM F 1083 based on the following:
- 1. Fence Height: Match existing height.
 - 2. Heavy-Industrial-Strength Material: Group IA, round steel pipe, Schedule 40.
 - a. Thread protectors shall not be used as couplings under any circumstances.
 - b. All pipe used in chain link fencing shall be stamped by the manufacturer, either with indelible ink or incused, indicating the pipe wall thickness, inside diameter, ASTM standard to which it conforms, and the manufacturer's name.

- c. Line Post: 2.375 inches in diameter.
 - d. End, Corner, Gate, and Pull Posts: 2.875 inches in diameter.
 - e. Flanging of end (terminal) posts:
 - 1) Terminal posts and gate posts shall only be flanged to assist in relocatable building moves.
 - 2) A larger pipe shall be dropped over a smaller post only when a short run of existing fencing is terminated and when digging a new hole to install a bigger terminal post is impractical. This shall be used as a temporary repair, not as a permanent repair or installation.
 - 3) If it is necessary to create a removable section of fence (to assist in relocatable building moves), a smaller pipe shall be sleeved into a smaller line post.
 - 4) Sleeves sizes shall conform to ASTM A53, Schedule 40.
 - a) For a 2-inch Interior Diameter (ID) sleeve, insert 1 1/2" ID pipe.
 - b) For a 2-1/2-inch ID sleeve, insert 2-inch ID pipe.
 - c) For a 3-inch ID sleeve, insert a 2 1/2-inch ID pipe.
3. Horizontal Framework Members: Comply with ASTM F 1043.
- a. Top Rails: Provide at all chain-link fencing. Fabricate top rail from lengths 21 feet or longer, with wedged-end or fabricated for expansion-type coupling, forming a continuous rail along top of chain-link fabric. Provide expansion couplings 6 inches long at each joint in top rails.
 - b. Intermediate Rails: where indicated. Match top rail for finish and size.
 - c. Bottom Rails: Also provide where decomposed granite, grass, planters and synthetic fields abut any fence line. Match top rail for finish and size.
4. Top Rails, Intermediate Rails, Bottom Rails and Brace Rails: 1.66 inches in diameter.
5. Post Brace Rails: Provide brace rail with truss rod assembly for each gate, end, and pull post. Provide two brace rails extending in opposing directions, each with truss rod assembly, for each corner post and for pull posts. Provide rail ends and clamps for attaching rails to posts.
6. Metallic Coating for Steel Framework:
- a. Type A: Not less than minimum 2.0-oz./sq. ft. average zinc coating according to ASTM A 123/A 123M; internal and external; hot-dipped after fabrication. All steel framework, components, hinges, hardware, wire fabrics and tension wire to be galvanized.
7. Polymer coating over metallic coating.
- a. Color: As selected by Architect from manufacturer's full range, according to ASTM F 934.
8. Schedule of Pipe Sizes: See following Table 1.

TABLE 1

ASTM A53 Threaded and Coupled Pipe
Black and Galvanized 1/2" to 6"

9.

Nominal Size	Outside Diameter		Wall Thickness			Weight		
	Inches	mm	Inch	mm	No	lb/ft	Kg/m	Kg/ft
1/2"	0.084	21.3	0.109	2.77	40 (STD)	0.85	1.26	0.39
			0.147	3.73	80 (XS)	1.09	1.62	0.49
3/4"	1.050	26.7	0.113	2.87	40 (STD)	1.13	1.68	0.51
			0.154	3.91	80 (XS)	1.48	2.20	0.67
1"	1.315	33.4	0.133	3.38	40 (STD)	1.68	2.50	0.76
			0.179	4.55	80 (XS)	2.18	3.24	0.99
1 1/4"	1.660	42.2	0.140	3.56	40 (STD)	2.288	3.39	1.04
			0.191	4.85	80 (XS)	3.02	4.49	1.37
1 1/2"	1.900	48.3	0.145	3.68	40 (STD)	2.73	4.06	1.24
			0.200	5.08	80 (XS)	3.66	5.45	1.66
2"	2.375	60.3	0.154	3.91	40 (STD)	3.68	5.42	1.67
			0.208	5.54	80 (XS)	5.07	7.55	2.30
2 1/2"	2.875	73.0	0.203	5.16	40 (STD)	5.82	8.66	2.64
			0.276	7.01	80 (XS)	7.73	11.50	3.51
3"	3.500	88.9	0.216	5.49	40 (STD)	7.62	11.34	3.46
			0.300	7.62	80 (XS)	10.33	15.37	4.69
3 1/2"	4.000	101.6	0.226	5.74	40 (STD)	9.2	13.69	4.18
			0.318	8.08	80 (XS)	12.63	18.80	5.73
4"	4.500	114.3	0.237	6.02	40 (STD)	10.89	16.21	4.94
			0.337	8.56	80 (XS)	15.17	22.58	6.89
6"	6.625	168.3	0.280	7.11	40 (STD)	18.97	28.23	8.60
			0.312	7.92	80 (XS)	21.04	31.31	9.54

2.4 TENSION WIRE

- A. General: Provide horizontal bottom tension wire at all fence fabric not having a bottom rail.
- B. Metallic-Coated Steel Wire: 0.177-inch-diameter, marcelled tension wire according to ASTM A 817 or ASTM A 824, with the following metallic coating:
 1. Type II: Zinc coated (galvanized) by hot-dip process, with a Class 4 minimum coating weight; not less than 1.2 oz./sq. ft. of uncoated wire surface.

2.5 SWING GATES

- A. General: Comply with ASTM F 900 for gate posts and single or double swing gate types. See Table 2 for sizes.
1. Gate Leaf Width: As indicated.
- B. Pipe and Tubing:
1. Zinc-Coated Steel: ASTM A 53, ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framework; Schedule 40.
 2. Gate Posts: Round hot-dipped galvanized tubular steel with inside dimensions and weight according to Table 2 for the gate leaf widths required.
 - a. All gate posts shall be of sufficient strength so that the total deflection of the gate and the post at the end of the gate leaf shall not exceed the lesser of 2% of the gate leaf width or 4 inches.
 - b. When necessary to meet this requirement due to the total weight of the gate leaf, the next larger size posts required shall be used. Gates shall not be equipped with rollers or casters for support.
 3. Gate Frames and Bracing: Round hot-dipped galvanized tubular steel with minimum diameter of 1.900-inch. Provide diagonal cross-bracing, consisting of 3/8-inch diameter adjustable-length truss rods on welded gate frames, where necessary to obtain frame rigidity without sag or twist.
- C. Frame Corner Construction: Welded, with 5/16-inch diameter adjustable truss rods for panels 5 feet wide or wider.

2.6

TABLE 2

Swing gate member sizes		
Gate opening	Nominal size	lb/ft.
Single leaf to 6 feet	2 1/2"	5.79
Double leaf to 12 feet opening		
Single leaf 6 to 13 feet	3 1/2"	9.11
Double leaf 12 to 26 feet opening		
Single leaf 13 to 18 feet	6"	18.97
Double leaf 26 to 36 feet opening		

- A. Hardware:
1. Hinges: Heavy-duty offset, with 180-degree outward swing.

- a. In addition to bolting, spotweld all hinges to posts.
2. Latch: Permitting operation from both sides of gate.
 - a. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.
 - b. Single latches shall be industrial gravity type gate latch with automatic stop.
 - c. Double latch shall be drop bar 1.315-inch diameter nominal pipe size securely bolted to gate frame and shall engage an iron gate stop. Drop bar shall engage 1.900-inch pipe diameter pipe sleeve set in concrete. Provide drop bar keeper on gate to secure it in lifted position.
 - d. In addition to bolting, spotweld all latches to posts.
3. Padlock and Chain:
 - a. Provide means of padlocking gates in the open position where indicated that gate must be locked in open position during activity hours.
 - b. Chains: Provide each gate with 3-foot length of chain to secure gate to fence with a padlock when open. Install 3/4-inch round eye, cadmium plated harness snap on one end of chain. Secure chain with spotweld.
4. All screws and bolts shall be tamper-proof.
5. Provide center gate stops.
6. For all gates more than 5 feet wide, provide keepers.
7. Hardware for gates that are part of the access or egress system:
 - a. Gates (in Path-of-Travel), hardware, maneuvering clearances, and operation shall comply with applicable portions of CBC accessibility requirements and CBC chapter 10..
 - b. Omit latch and make provisions to receive exit device hardware.
 - c. Provide 16 gage steel plate for mounting of exit device on gate and exit device latch on post. Size plate to protect against unauthorized operation of the exit device from the exterior as shown.
 - d. Closer: See Hardware Sets G01 and G02 in Section 08 71 00 "Door Hardware"
 - e. Mount operating hardware at minimum 34 inches and maximum 44 inches above grade or pavement surface.
8. See section 08 71 00 "Door Hardware".

2.7 FITTINGS

- A. Provide fittings according to ASTM F 626.
- B. Post and Line Caps: Hot-dipped galvanized pressed steel or hot-dipped galvanized cast iron. Provide weathertight closure cap for each post.
 1. Provide line post caps with loop to receive top rail.

- C. Rail and Brace Ends: Hot-dipped galvanized pressed steel or hot-dipped galvanized cast iron. Provide rail ends or other means for attaching rails securely to each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
 - 1. Top Rail Sleeves: Hot-dipped galvanized pressed steel or hot-dipped galvanized round-steel tubing not less than 6 inches long.
 - 2. Rail Clamps: Hot-dipped galvanized pressed steel. Provide line and corner boulevard clamps for connecting intermediate and bottom rails to posts.
- E. Tension and Brace Bands: Hot-dip galvanized pressed steel. Provide bands with projecting edges chamfered or eased.
- F. Tension Bars: Hot-dipped galvanized steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading, rod and turnbuckle or other means of adjustment.
- H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
 - 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
 - a. Hot-Dip Galvanized Steel: 0.148-inch-diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
- I. Finish:
 - 1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.

2.8 CAST-IN-PLACE CONCRETE

- A. General: Comply with ACI 301 for cast-in-place concrete.
- B. Materials: Portland cement complying with ASTM C 150 Type II, aggregates complying with ASTM C 33, and potable water for ready-mixed concrete complying with ASTM C 94.
 - 1. Concrete Mixes: Normal-weight concrete with not less than 3000-psi compressive strength (28 days), 4-inch slump, and 1-inch maximum size aggregate.

2.9 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

2.10 GROUNDING MATERIALS

- A. Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- B. Connectors and Grounding Rods: Listed and labeled for complying with UL 467.
 - 1. Connectors for Below-Grade Use: Exothermic welded type.
 - 2. Grounding Rods: Copper-clad steel, 5/8 by 96 inches.

2.11 OTHER MATERIALS

- A. Galvanizing Repair Material: Cold-applied, zinc-rich coating conforming to ASTM A 780.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for a certified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
 - 1. Do not begin installation before final grading is completed unless otherwise permitted by District Construction Manager.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

- B. Clear fence line of trees, brush, and other obstacles to install fencing. Establish a graded, compacted fence line prior to fencing installation.

3.3 CHAIN-LINK FENCE INSTALLATION

- A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.
 - 1. Install fencing on established boundary lines inside property line.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
 - 1. If rock is encountered, excavate in accordance with 31 20 00 "Earth Moving."
- C. Post Setting: Set posts in concrete footings at indicated spacing into firm, undisturbed or compacted soil. Using mechanical devices to set line posts per ASTM F 567 is not permitted.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices until concrete is sufficiently cured.
 - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Dimensions and Profile: As indicated on Drawings. Install concrete footings at all fence posts.
 - b. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water. Keep exposed concrete moist for at least 7 days after placement, or cured with an approved membrane curing material.
 - c. Concealed Concrete: Place top of concrete 2 inches below grade to allow covering with surface material.
 - d. Posts Set into Sleeves in Concrete: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed according to anchoring material manufacturer's written instructions. Finish anchorage joint to slope away from post to drain water.
 - e. Posts Set into Holes in Concrete: Form or core drill holes to depth indicated on drawings and 3/4-inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed according to anchoring material manufacturer's written instructions. Finish anchorage joint to slope away from post to drain water.
- D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or

more. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.

- E. Line Posts: Space line posts uniformly as follows:
 - 1. Standard fencing: 10 feet o.c.
 - 2. High Security fencing: 8 feet o.c.
- F. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
 - 1. Locate horizontal braces at mid-height of fabric 72 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- G. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:
 - 1. Extended along bottom of fence fabric. Install bottom tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.
- H. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- I. Intermediate Rails: where indicated, install in one piece at post-height center span, spanning between posts, using fittings, special offset fittings, and accessories.
- J. Bottom Rails: Where indicated, install and secure to posts with fittings.
- K. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2-inch bottom clearance between finish grade or surface and bottom selvage, and 1-inch unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released. Do not allow fabric to be in contact with finish grade.
- L. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches o.c.
- M. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180

degrees, and attach other end to chain-link fabric according to ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.
- N. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

3.5 GROUNDING AND BONDING

- A. Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- B. Fences Enclosing Electrical Power Distribution Equipment: Ground according to IEEE C2 unless otherwise indicated.
- C. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at grounding location.
- D. Connections:
 1. Make connections with clean, bare metal at points of contact.
 2. Make above-grade ground connections with mechanical fasteners.
 3. Make below-grade ground connections with exothermic welds.
 4. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests.
- B. Grounding Tests: Comply with requirements in Section 26 41 13 "Lightning Protection for Structures."
- C. Prepare test reports.

3.7 TOLERANCES

- A. Maximum Offset From True Position: 1-inch.
- B. Maximum Variation From Plumb: 1/4-inch. Vertical post tolerance of 1/4-inch shall be after the fabric has been stretched.
- C. Components shall not infringe adjacent property lines.

3.8 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

3.9 GALVANIZING REPAIR

- A. Clean and repair galvanized surfaces damaged by welding or abrasion, cut ends of fabric, and other cut sections with specified galvanizing repair material applied in conformance with manufacturer's printed instructions.

3.10 DEMONSTRATION

- A. Engage a factory-authorized service representative to train District's maintenance personnel to adjust, operate, and maintain chain-link fences and gates.

END OF SECTION 32 31 13

SECTION 32 31 19
DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Decorative steel fences.
 - 2. Decorative steel swing gates.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for concrete.
 - 2. Section 08 71 00 "Door Hardware" for gate hardware.

1.3 COORDINATION

- A. Coordinate gate hardware to comply with single source manufacturer requirement specified in section 08 71 00 Door Hardware.
- B. Gates across an exit to a public way or to a safe dispersal area shall have panic hardware.

1.4 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Convene an on-site meeting a minimum of two weeks before the Work in this Section is to commence. Agenda items shall include but are not limited to the following:
 - 1. Review required testing, inspecting, and certifying procedures.
 - 2. Review the overall project schedule and the schedule for installation of the decorative metal fences and gates.
 - 3. Review campus security with the overall fence plan.
 - 4. Review the scope of work for the decorative metal fences and gates.
 - 5. Confirm the availability of fencing materials and accessories for the Work

6. Confirm the availability of adequate number of installers for the scope of work.
7. Review locations of accessible routes, site utilities, security requirements, and emergency access routes
8. Mockup review.
9. Questions and Clarifications

- B. Refer to Section 01 31 00 "Project Management" for participant list and additional agenda topics

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 the following:

- a. Fence and gate posts, rails, pickets and fittings.
- b. Gates and hardware.

- B. Shop Drawings: For fencing and gates.

1. Include plans, elevations, sections, details, gate locations, details of gate swing, or other operation, hardware, and accessories, post spacing, and mounting and attachment details.

- C. Samples: For each fence material and for each color specified.

1. Provide Samples 12 inches in length for linear materials.
2. Provide Samples 12 inches square for bar grating and perforated metal fence/gate infill panels.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding Certificates.

1.7 REGULATORY REQUIREMENTS

- A. Comply with the California Building Code (CBC) 2022 Edition
- B. Pedestrian gates as part of an accessible route shall comply with CBC Sections 11B-404.
- C. The clear opening width for a pedestrian gate shall be 32" minimum for a swinging gate shall be measured between the face of the door and the stop, with the door open 90 degrees. There shall be no projections into it below 34"; up to 4" maximum projections are allowed between 34" and 80" above the finish floor or ground. CBC Section 11B-404.2.3

- D. Handles, pulls, latches, locks, and other operable parts on accessible pedestrian gates shall comply with CBC Section 11B-309.4 and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34" minimum and 44" maximum above finish floor or ground. Where sliding pedestrian gates are in the fully open position, operating hardware shall be exposed and usable from both sides. CBC Section 11B-404.2.7
- E. The force for pushing or pulling open a pedestrian gate shall be as follows, per CBC Section 11B-404.2.9: 5 pounds push or pull.
- F. Hinged pedestrian gates: 5 pounds (22.2 N) maximum. 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.
- G. The force required for activating any operable parts, such as lever hardware, or disengaging other devices shall be 5 pounds (22.2N) maximum to comply with CBC Section 11B-309.4.
- H. The levers of lever actuated latches or locks for accessible gates shall be curved with a return to within 1/2" of the gate surfaces to prevent catching on the clothing or persons. California Referenced Standards Code. T-24 Part 12, Section 12-10-202, Item (F).
- I. Swing doors and gate surfaces within 10" of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16" of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped. CBC Section 11B-404.2.10.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel."
- C. Post and rail piping shall not be installed until the Project Inspector verifies that the material meets the specified weight per lineal foot for each pipe size to be used.
- D. Post footing excavations shall be approved by the Project Inspector prior to setting any posts
- E. Testing Agency Qualifications: For testing fence grounding, member company of NETA or NRTL.
 - 1. Testing Agency's Field Supervisor; Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Lightning Protection System: Maximum resistance-to-ground value of 25 ohms at each grounding location along fence under normal dry conditions.

2.2 DECORATIVE STEEL FENCES

- A. Decorative Steel Fences: Fences made from steel tubing, bars and shapes, hot-dip galvanized. (to match existing)
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ameristar Fence Products.
 - b. IN-LINE Fence & Railing Co.
 - c. Metalco Fence & Railing Systems; Atlantis Products, Inc.
 - d. Or Equal.
- B. Posts: Square steel tubing. (to match existing)
- C. Line Posts: As indicated; wall thickness: As indicated to match existing
 - 1. End and Corner Posts: As indicated; wall thickness: As indicated.
 - 2. Swing Gate Posts: As indicated; Wall thickness: As indicated.
- D. Post Caps (to match existing)
 - 1. Provide caps on all posts to prevent water from entering posts.
 - 2. Shape: Provide 1/4" thick steel caps welded to the top of the posts.
- E. Rails:
 - 1. Steel Tube Rails: As indicated to match existing.
- F. Pickets: As indicated to match existing
 - 1. Extend pickets to top rail as indicated.
 - 2. Picket Spacing: spaced so that a 4" sphere cannot pass between pickets.
- G. Fasteners: Stainless-steel carriage bolts and tamperproof nuts or as indicated
- H. Fabrication: Assemble fences into sections by welding pickets to rails.
 - 1. Weld assembled sections to posts.
- I. Welding:
 - 1. Weld-all-around rails to posts with 1/8-inch fillet welds or as indicated.

DECORATIVE METAL FENCES AND GATES**32 31 19 - 4****DEHESA SCHOOL MODERNIZATION**

2. Weld-all-around pickets to rails with 3/32-inch fillet welds or as indicated.
 - J. Finish exposed welds to comply with NOMMA Guideline 1, Finish #3 - partially dressed weld with splatter removed.
 - K. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
 1. Hot-dip galvanize posts and rails.
 2. Hot-dip galvanize rail and picket assemblies after fabrication.
 3. Hot-dip galvanize bar grating infill after fabrication.
 4. Hot-dip galvanize custom-design rail and infill assemblies after fabrication.
- 2.3 SWING GATES: As indicated
- A. Gate Configuration: As indicated.
 - B. Gate Frame Height: As indicated
 - C. Gate Opening Width: As indicated
 - D. Galvanized-Steel Frames and Bracing: Fabricate as indicated and hot-dip galvanize after fabrication.
 - E. Frame Corner Construction: Welded.
 - F. Additional Rails: Provide as indicated, complying with requirements for fence rails.
 - G. Tube steel kick at the bottom of gate as indicated.
 - H. Picket Size, Configuration, and Spacing: As indicated. Comply with requirements for adjacent fence.
 - I. Gate Hardware: provide all hardware for proper functioning of gates. Provide latches, hinges, and keepers. Weld latches to gate and fence assembly with a minimum of two spot welds per each end each side. Weld all other hardware all around perimeter.
1. Hinges: Guarding Galvanized 2060.200 heavy duty galvanized roller cage bearing gorilla hinges.
 - a. Attachment: Fully welded.
 - b. Allow 180-degree swing.
 - c. Rated: 1000 lb minimum per hinge. Rating to match gate weight.
 - d. www.guardiangatehardware.com
 - e. 1-800-866-9115.

2. Heavy Duty Latches for Decorative Metal Gates (non-hollow metal door gates):
Shall permit operation, locking and unlocking from both sides of gate.
 - a. In addition to bolting, spotweld all latches to posts and gates, weld on each side to posts, each side to gate frames, minimum of 2 spot each side.
 - b. Latches shall permit operation, locking and unlocking from both sides of gate.
 - c. Single latches shall be industrial gravity type gate latch with automatic stop.
 - d. Manufacture: DAC Industries, 800-888-9768, <https://dacindustries.com/> or approved equal.
 - e. Strong-Arm Commercial Latches or Approved Equal.
 - f. Strong Arm Walk Gate Latches or Approved Equal.
 - g. Provide custom sizes to accommodate gate frames and posts sizes.
 - h. Latches shall provide integral eye openings for padlocking; and allow padlock accessible from both sides of gate.
 3. Drop Bars (non-hollow metal door gates):
 - a. Double gates shall be provided with drop bar 1.315-inch minimum diameter nominal pipe size securely bolted to gate frame and shall engage an iron gate stop.
 - b. Drop bar shall engage 1.900-inch pipe diameter pipe sleeve set in concrete.
 - c. Provide drop bar keeper on gate to secure it in lifted position.
 - d. Provide drop bars with hasps for padlocking in down and up position to ensure proper locking of double / pairs of gates.
 4. Padlock and Chain:
 - a. Provide means of padlocking gates in the open and closed position.
 - b. Chains: Provide each gate with 3-foot length of chain to gate and to fence. Install 3/4-inch round eye, cadmium plated harness snap on one end of chain. Secure chain with spotweld.
 - c. Weld District provided padlock into chain with chain removal stop steel washer.
 - J. Finish exposed welds to comply with NOMMA Guideline 1, Finish #3 - partially dressed weld with splatter removed.
 - K. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- 2.4 STEEL AND IRON
- A. Plates, Shapes, and Bars: ASTM A 36/A 36M.

- B. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.
- C. Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- D. Bar Grating: NAAMM MBG 531.
 - 1. Bars: Hot-rolled steel strip, ASTM A 1011/A 1011M, Commercial Steel, Type B.
 - 2. Wire Rods: ASTM A 510/A 510M.
- E. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 50, with G90.
- F. Castings: Either gray or malleable iron unless otherwise indicated.
 - 1. Gray Iron: ASTM A 48/A 48M, Class 30.
 - 2. Malleable Iron: ASTM A 47/A 47M.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Section 03 30 00 "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 4000 psi, 4-inch slump, and 1-inch maximum aggregate size.
- C. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M and specifically recommended by manufacturer for exterior applications.
- D. Galvanizing Repair: Repair compound meeting or exceeding ASTM A 780.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Do not begin installation before final grading is completed unless otherwise permitted by District Project Manager.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.
 - 1. Construction layout and field engineering are specified in Section 01 73 00 "Execution."

3.3 DECORATIVE FENCE INSTALLATION

- A. Install fences according to manufacturer's written instructions.
- B. Install fences by setting posts as indicated and field welding the rails of the assemblies to posts.
- C. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter as indicated for height of fence..
- D. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend 2 inches above grade. Finish and slope top surface to drain water away from post.
 - 3. Posts Set in Concrete: Extend post to within 6 inches of specified excavation depth, but not closer than 3 inches to bottom of concrete.
 - 4. Space posts uniformly at indicated spacing.

3.4 GATE INSTALLATION

- A. Install gates level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation, 5-pound operating force and lubricate where necessary.

3.5 GALVANIZING REPAIR

- A. Repair damaged galvanizing and coat field welded areas with 2 coats of galvanizing repair compound.

3.6 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

END OF SECTION 32 31 19

SECTION 33 42 00
STORMWATER CONVEYANCE

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Reference Standards:
 - 1. Standard Specifications for Public Works, current edition, including Regional and City of San Diego Supplemental Amendments.
 - 2. City of San Diego Standard Specifications for Public Works Construction (Whitebook), current edition.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe and fittings.
 - 2. Nonpressure transition couplings.
 - 3. Cleanouts.
 - 4. Drains.
 - 5. Cleanouts.
 - 6. Catch basins.
- B. Related Requirements:
 - 1. Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling, and underground warning tapes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Drop inlets.
 - 2. Cleanouts and drains.
 - 3. Pipe and fittings.
- B. Shop Drawings:
 - 1. Cleanouts: Include plans, elevations, sections, details, frames, and covers.

2. Catch basins. Include plans, elevations, sections, details, frames, covers, and grates.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Video Recording: Video recording of below grade facility sanitary waste piping with annotated full size and 11x17 drawings. Recording shall include all new piping installed as part of this contract.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic cleanouts, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle cleanouts according to manufacturer's written rigging instructions.
- D. Handle catch basins according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by District or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 1. Notify District Construction Manager no fewer than three days in advance of proposed interruption of service.
 2. Do not proceed with interruption of service without District Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service and Extra-Heavy classes.
- B. Gaskets: ASTM C 564, rubber.

- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.2 PE PIPE AND FITTINGS

- A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.
 - 1. Silt-tight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
- B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294M, Type S, with smooth waterway for coupling joints.
 - 1. Silt-tight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.

2.3 PVC PIPE AND FITTINGS

- A. PVC Gravity Sewer Piping:
 - 1. Pipe and Fittings: ASTM F 679, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.

2.4 NONPRESSURE TRANSITION COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
 - 1. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded, Flexible Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fernco Inc.
 - b. Mission Rubber Company.
 - c. NDS Inc.
 - d. Or Equal.

2. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Ring-Type, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fernco Inc.
 - b. Logan Clay Pipe.
 - c. Mission Rubber Company.
 - d. Or Equal.
2. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.5 CLEANOUTS

A. Concrete Cleanouts:

1. Materials and dimensions according to City of San Diego standards. Cleanout types and additional dimensions as indicated on Drawings. Provide heavy duty frames and grates.

B. Plastic Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. NDS Inc.
 - b. Sioux Chief Manufacturing Company, Inc.
 - c. Zurn Industries, LLC.
 - d. Or Equal.
2. Description: PVC body with PVC threaded plug. Include PVC drain pipe fitting and riser to cleanout of same material as drain piping.

2.6 DRAINS

A. Cast-Iron Area Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Smith, Jay R. Mfg. Co.
 - b. Watts; a Watts Water Technologies company.
 - c. Zurn Industries, LLC.

- d. Or Equal.
 - 2. Description: ASME A112.6.3 gray-iron round body with anchor flange and round secured grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
 - 3. Top-Loading Classification(s): Medium and Heavy Duty.
- B. Cast-Iron Trench Drains:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Smith, Jay R. Mfg. Co.
 - b. Watts; a Watts Water Technologies company.
 - c. Zurn Industries, LLC.
 - d. Or Equal.
 - 2. Description: ASME A112.6.3, 6-inch-wide top surface, rectangular body with anchor flange or other anchoring device, and rectangular secured grate. Include units of total length indicated and quantity of bottom outlets with inside calk or spigot connections, of sizes indicated.
 - 3. Top-Loading Classification(s): Medium, Heavy, and Extra-Heavy Duty.
- C. Steel Trench Drains:
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Rockford Sanitary Systems, Inc.
 - b. Or Equal.
 - 2. Description: Factory fabricated from ASTM A 242/A 242M, welded steel plate, to form rectangular body with uniform bottom downward slope of 2 percent toward outlet, anchor flange, and grate. Include units of total length indicated, bottom outlet of size indicated, outlet strainer, acid-resistant enamel coating on inside and outside surfaces, and grate with openings of total free area at least two times cross-sectional area of outlet.
 - 3. Plate Thicknesses: 1/8-inch and 1/4-inch.
 - 4. Overall Widths: 7-1/2 inches and 12-1/3 inches.
 - a. Grate Openings: 3/8-inch circular or 3/8-by-3-inch slots.

2.7 CATCH BASINS

- A. Standard Precast Concrete Catch Basins:
- 1. Materials and dimensions per City of San Diego standards.
 - 2. Type of catch basin and additional dimensions as indicated on Drawings.

2.8 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to City of San Diego standards.
- B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to City of San Diego standards. Include heavy-duty frames and grates.
- C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to City of San Diego standards. Include heavy-duty frames and grates.
- D. Frames and Grates: Heavy duty, according to City of San Diego standards.

PART 3 - EXECUTION**3.1 PIPING INSTALLATION**

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install cleanouts for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing drain is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow.
 - 2. Install piping with 36-inch minimum cover unless drawings indicate otherwise.
 - 3. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 - 4. Install corrugated steel piping according to ASTM A 798/A 798M.
 - 5. Install PE corrugated drain piping according to the following:

- a. Encase in Type C rock envelope according to City of San Diego Standard Drawing SDS110. Surround crushed rock with filter fabric.
- b. Pipe with less than 2 feet of cover: Encase in concrete according to Regional Standard Drawing S-7.
- c. Backfill trench and compact.
6. Install PVC drain piping according to ASTM D 2321 and ASTM F 1668.
7. Install concrete drain piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.2 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
 1. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
 2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
 3. Join corrugated steel drain piping according to ASTM A 798/A 798M.
 4. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
 5. Join PVC profile gravity drain piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
 6. Join concrete drain piping according to ASTM C 14 and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
 7. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.3 CLEANOUT INSTALLATION

- A. Concrete Cleanouts: Construct concrete cleanouts according to City of San Diego standards. Set cleanout frames and covers flush with finished surface.
- B. Plastic Cleanouts: Use cast-iron soil pipe fittings in drain pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in drain pipe.
 1. Install cleanouts and riser extensions from drain pipes to cleanouts at grade.
 2. Use commercially manufactured 45 degree wye and 45 degree bend fittings in storm drain pipes and risers for cleanouts.
 3. Install piping so cleanouts open in direction of flow in storm drain pipe.
 4. Unpaved Areas: Set cleanout tops 1-inch above surrounding earth grade.
 5. Paved Areas (Walkways, Roadways, etc.): Set cleanout tops flush with pavement surface.

3.4 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.

1. Use Light-Duty, top-loading classification drains in earth or unpaved foot-traffic areas.
 2. Use Medium-Duty, top-loading classification drains in paved foot-traffic areas.
 3. Use Heavy-Duty, top-loading classification drains in vehicle-traffic service and parking areas.
 4. Use Extra-Heavy-Duty, top-loading classification drains in roads.
- B. Embed drains in 4-inch minimum concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.
- E. Assemble trench sections with flanged joints.
- F. Embed trench sections in 4-inch minimum concrete around bottom and sides.

3.5 CATCH BASIN INSTALLATION

- A. Construct in accordance with City of San Diego standards.
- B. Construct to sizes and shapes indicated on Drawings
- C. Set frames and grates to elevations indicated.

3.6 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318.

3.7 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains.
- B. Make connections to existing piping and underground manholes or cleanouts.
1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes, cleanouts, and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed

around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, cleanout, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

- a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
 - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
 4. Protect existing piping, manholes, cleanouts, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure drain piping unless otherwise indicated.
 - a. Shielded flexible couplings for same or minor difference OD pipes.
 - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
 2. Use pressure-type pipe couplings for force-main joints.

3.8 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes, Cleanouts, and Structures: Excavate around manholes, cleanouts, and structures as required and use one procedure below:
1. Remove manhole, cleanout, or structure and close open ends of remaining piping.
 2. Remove top of manhole, cleanout, or structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

- C. Backfill to grade.

3.9 IDENTIFICATION

- A. Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 - 1. Use warning tape or detectable warning tape over ferrous piping.
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.10 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Submit separate report for each test.
 - 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Exception: Piping with soil-tight joints unless required by authorities having jurisdiction.
 - b. Option: Test plastic piping according to ASTM F 1417.

- c. Option: Test concrete piping according to ASTM C 924.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.11 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 33 42 00