

SAN LUIS OBISPO HIGH SCHOOL NEW CLASSROOM BUILDING & RELOCATION OF MODULAR RESTROOM

SAN LUIS OBISPO HIGH SCHOOL
1499 SAN LUIS DRIVE • SAN LUIS OBISPO, CALIFORNIA 93401

PROJECT MANUAL

06/01/2026 • KBZ JOB NO. 24010 • TRACKING NO. 68809-82
DSA APPLICATION NO. 03-125456

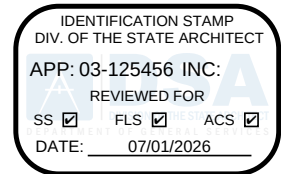
SAN LUIS COASTAL UNIFIED SCHOOL DISTRICT
1500 Lizzie Street • San Luis Obispo, CA 93401 • Phone (805) 549-1200



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SPECIFICATION MANUAL
for the: **SAN LUIS OBISPO HIGH SCHOOL**
NEW CLASSROOM BUILDINGS AND RELOCATE RESTROOMS



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SLCUSD SAN LUIS OBISPO HIGH SCHOOL
NEW CLASSROOM BUILDING & RELOCATION OF MODULAR RESTROOM
DSA A# 03-125456

THOMA ELECTRIC

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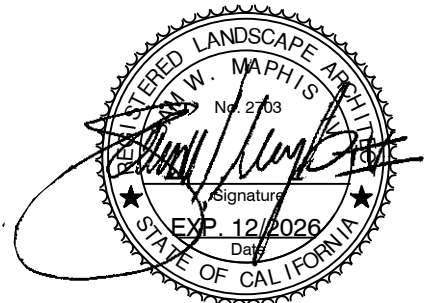
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Landscape Architect

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SLCUSD SAN LUIS OBISPO HIGH SCHOOL
NEW CLASSROOM BUILDING & RELOCATION OF MODULAR RESTROOM
DSA A# 03-125456

**PROJECT MANUAL
for the
SAN LUIS OBISPO HIGH SCHOOL
NEW CLASSROOM BUILDING AND RELOCATE RESTROOM
1499 San Luis Drive
San Luis Obispo, California 93401**

OWNER: BOARD OF EDUCATION
San Luis Coastal Unified School District
1500 Lizzie Street
San Luis Obispo, CA 93401
(805) 596-4105

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LANDSCAPE ARCHITECT: EARTHFORM DESIGN
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- A. Site Fire Safety Plan must be filed concurrently with the DSA 102-IC Construction Start Notice form. The plan must be created by the successfully awarded contractor and submitted to the Architect of Record within 7 days of the Board award of contract. For details on the required components of the Plan, see bulletin *DSA BU 24-05: Fire Safety During Construction and Demolition* attached herewith at the end of this Addendum.

1.2 BUILDING CODE REQUIREMENTS

- A. All work shall be compliant with California Building Code Title 24, for Parts 1-6 and 9.
- B. California Building Code Title 24, Parts 1-5 must be kept on site during construction.

1.3 CONFLICTS OR INCONSISTENCIES

- A. If any conflicts or inconsistencies exist between the specifications and the drawings (including the general notes), more stringent requirements shall take precedence.

1.4 ADDENDA

- A. All Addenda must be signed by the Architect and approved by DSA (Section 4-338, Part 1).

1.5 SUBSTITUTIONS AND REVISIONS

- A. All substitutions affecting DSA-regulated items shall be considered as a Construction Change Document (CCD) or Addenda and shall be approved by DSA prior to fabrication and installation. (IR A-6 and Section 4-338(c), Part 1).
- B. DSA-regulated items are those which affect structural, life-safety, and/or accessibility components.
- C. Construction Change Documents must be signed by all the following:
 - 1. Architect of Record.
 - 2. Structural Engineer.
 - 3. Delegated Professional Engineer (when applicable).
 - 4. DSA.

1.6 PROJECT INSPECTOR AND TESTING LABORATORY

- A. The Project Inspector and Testing Lab must be employed by the Owner and approved by all of the following:

1. Architect of Record.
2. Structural Engineer.
3. DSA.

PART 2 - PRODUCTS (Not Used)

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END OF SECTION 010001

SECTION 011000 - 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. Owner-furnished/Contractor-installed (OFCI) products.
 - 4. Contractor's use of site and premises.
 - 5. Coordination with occupants.
 - 6. Work restrictions.
 - 7. Specification and Drawing conventions.

- B. Related Requirements:

- 1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: San Luis Obispo High School – New Classroom Buildings and Relocate Restroom.

- 1. Project Location: San Luis Obispo High School, 1499 San Luis Drive, San Luis Obispo, CA 93401

- B. Owner: San Luis Coastal Unified School District.

- 1. Owner's Representative: Chris Bonin, Director of Facilities, Operations and Transportation; (805) 596-4105.

- C. Architect: Kruger Bensen Ziemer Architects, Inc.; Joe S. Wilcox, AIA; (805) 963-1726.

- D. Architect's Consultants: Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

- 1. Structural Engineer: Stork, Wolfe & Associates. Greg Stork (805) 548-8600.
 - 2. Mechanical Engineer: BMA Mechanical+, Brandon Rodgers, (805) 548-1445.
 - 3. Electrical Engineer: Thoma Electric, Jeff Thoma, (805) 543-3850.

4. Civil Engineer: Flowers and Associates, Robert Schmidt (805) 966-2224
5. Landscape Architect: Earthform Design, Sam Maphis (805) 963-2006

E. Web-Based Project Software: Project software administered by District will be used for purposes of managing communication and/or documents during construction.

1. See Section 013100 "Project Management and Coordination" for requirements for establishing, administering, and using web-based Project software.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. New classroom Buildings
2. Relocate existing restroom building

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:

1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
2. Provide for delivery of Owner-furnished products to Project site.
3. Upon delivery, inspect, with Contractor present, delivered items.
 - a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

1.6 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Restricted Use of Site: 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.
- B. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, students, and emergency vehicles at all times. Do not use these areas for parking or for 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.
 - c. No deliveries are permitted during peak pick up and drop off hours for Los Ranchos Elementary School. Owner will provide Contractor a schedule of peak pickup and drop off hours occurring during construction period.
 - d. All delivery vehicles entering or exiting the site to be accompanied at all times by at least two flaggers from the driveway entrance to the final delivery location.
- C. Condition of Existing Buildings: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. 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.

1.7 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will occupy the premises during the entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner'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 Owner and authorities having jurisdiction.
 - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Owner Limited Occupancy of Completed Areas of Construction: Owner 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 Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
3. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.8 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 in the existing building to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated.
 1. Weekend Hours: Upon written approval by Owner, limit working hours to 8:00 a.m. to 5:00 p.m.
 2. Early Morning Hours: Early morning work will not be permitted.
 3. Hours for Utility Shutdowns/Interruptions: Contractor shall schedule utility shutdowns/interruptions that will affect occupied areas of the property and/or adjacent building(s) during non-school-hours. Otherwise, provide Owner not less than two days' notice of planned utility shutdowns and obtain written Owner approval before proceeding. Provide temporary utility services as required by Owner.
 4. Hours for Core Drilling, Concrete Sawcutting, and Similar Noisy Activities: Noisy activities shall not be permitted while State Testing is occurring. Owner will provide Contractor a schedule of State Testing dates.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 1. Notify Owner not less than two days in advance of proposed disruptive operations.
 2. Obtain Owner's written permission before proceeding with disruptive operations.

- E. Restricted Substances: Use of tobacco products, alcohol, and other controlled substances on school premises is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times. When upon school premises, all construction personnel are required to wear a photo ID badge continuously, visible at all times on the left hand side of the body, and not concealed under clothing. All photo ID badges worn on the project shall be obtained from the same source, professionally manufactured, with identical layout and graphics, and in compliance with the following:
 - 1. The photo ID card shall be 2-1/8" x 3" (credit card size) of durable and waterproof construction.
 - 2. Badge shall contain the individual's full legal name and company affiliation.
 - 3. The photo shall be in compliance with US passport requirements as noted below:
 - a. Taken within the past 6 months showing current appearance.
 - b. Color.
 - c. Full face, front view with a plain white or off-white background.
 - d. Between 1" and 1-3/8" from the bottom of the chin to the top of the head.
 - e. Taken in normal street attire. Uniforms shall not be worn in photograph.
 - f. Not taken wearing a hat or headgear that obscures the hair or hairline.
 - g. If the person normally wears prescription glasses, a hearing device, or similar articles, they should be worn for the picture.
 - h. Dark glasses or nonprescription glasses with tinted lenses are not acceptable unless needed for medical reasons (a medical certificate may be required).
- G. Employee Fingerprinting: Comply with Owner's requirements for fingerprinting of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.9 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 scheduled on Drawings.
- D. In case of inconsistencies between approved Drawings and approved Specifications in the descriptions of work to be done, equipment to be provided or material to be used, submit a Request for Information (RFI) to design team. It shall be the more stringent, the more restrictive, the higher quality, and the greater quantity of Work shall apply. If required by DSA IR A-6, submit revised Drawings and/or Specifications as result of such RFIs to the Division of the State Architect (DSA) via Construction Change Document (CCD) for review and approval.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012500 - 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 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

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.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

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 facsimile of form provided at 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 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 Owner and separate contractors, which 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 owners.
 - 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 Baseline 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 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 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.

1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

- 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. Requested substitution provides sustainable design characteristics that specified product provided.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Baseline Construction Schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. 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.

- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

- 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 offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.

- c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- d. Requested substitution provides sustainable design characteristics that specified product provided.
- e. Substitution request is fully documented and properly submitted.
- f. Requested substitution will not adversely affect Baseline Construction Schedule.
- g. Requested substitution has received necessary approvals of authorities having jurisdiction.

1) Substitution requests effecting structural safety, fire-life safety, and/or access compliance (DSA Construction Change Document, Category A) which would require DSA review and approval, as determined solely by the Architect, will not be considered.

- h. Requested substitution is compatible with other portions of the Work.
- i. Requested substitution has been coordinated with other portions of the Work.
- j. Requested substitution provides specified warranty.
- k. 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.

C. Contract Document Revisions:

- 1. Should a Contractor proposed substitution require revision of the Contract Drawings or Specifications, including revisions for the purpose of determining feasibility, scope or cost, or revisions for the for the purpose of obtaining review and approval by authorities having jurisdiction, Architect, Engineer(s) or other responsible design professional will make revisions as approved in writing in advance by the Owner or Owner's Representative.
- 2. Contractor shall pay for services of Architect, Engineer(s) or other responsible design professional for researching and reporting on proposed substitutions when such activities are considered additional services to the design services contracts of Architect, Engineer(s) or other consultant who is the responsible design professional.
- 3. Contractor shall pay for costs of services by Architect, Engineer(s) or other responsible design professional. These costs may include travel, reproduction, long distance telephone and shipping costs reimbursable at cost plus usual and customary mark-up for handling and billing.
- 4. Contractor shall pay such fees whether or not the proposed substitution is ultimately accepted by the Owner and a Change order is executed.

PART 2 - PRODUCTS (Not Used)

2.1 SCHEDULE OF FORMS

A. Substitution Request Form Next Page

END OF SECTION 012500

SUBSTITUTION REQUEST FORMTO: JOE WILCOX / MAT GRADIAS, KRUGER BENSEN ZIEMER ARCHITECTS, INC.PROJECT: NEW CLASSROOM BUILDING & RELOCATION OF MODULAR RESTROOM

SPECIFIED ITEM:

Section	Page	Paragraph	Description

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents which the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. The proposed substitution does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering or architectural design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse effect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.
5. The proposed substitution will not result in an increase to the Contract Price or the Contract Time.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item.

Submitted by:

Signature: _____

Firm: _____

Address: _____

Telephone: _____

Attachments: _____

Substitution Request Form Date: _____

For use by Architect:

☐ Accepted
☐ Accepted as noted
☐ Not Accepted
☐ Received too late

By: _____

Date _____

Remarks _____

SECTION 012600 - CONTRACT MODIFICATION 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 handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 14 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- e. Quotation Form: Use forms acceptable to Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 - 7. Proposal Request Form: Use form acceptable to Architect.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.
 - 1. The determination of costs and basis for establishing costs for changes in the Work shall be as specified in the General Conditions of the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

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SECTION 012900 - PAYMENT 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 necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment, or as otherwise indicated in the General Conditions.
 - 3. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.

- b. Owner's name.
 - c. Owner's Project number.
 - d. Name of Architect.
 - e. Architect's Project number.
 - f. Contractor's name and address.
 - g. Inspector of Record Name
 - h. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site.
6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
8. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
9. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.

10. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
11. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
12. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Submit Application for Payment to Architect by the fifth day of the month per the General Conditions. The period covered by each Application for Payment is one month, ending on the last day of the month.
 1. Submit draft copy of Application for Payment five days prior to due date for review by Architect and Inspector.
- D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
 1. Other Application for Payment forms proposed by the Contractor may be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

- F. **Stored Materials:** Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- G. **Transmittal:** Submit three signed and notarized original copies of each Application for Payment to Architect. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- H. **Waivers of Mechanic's Lien:** With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- I. **Initial Application for Payment:** Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Submittal schedule (preliminary if not final).
 5. List of Contractor's staff assignments.
 6. List of Contractor's principal consultants.

7. Copies of any required local permits.
 8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 9. Certificates of insurance and insurance policies.
 10. Performance and payment bonds.
 11. Data needed to acquire Owner's insurance.
- J. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706.
 5. AIA Document G706A.
 6. AIA Document G707.
 7. Evidence that claims have been settled.
 8. Final liquidated damages settlement statement.
 9. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

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SECTION 013100 - 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, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Digital project management procedures.
 - 5. Project meetings.
 - 6. Forms
 - a. Warranty Form
 - b. Substitution Request Form
- B. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

- B. Key Personnel Names: Within 15 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, 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, and in prominent location in each built facility. 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. Where necessary, 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.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and Inspector of Record to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, 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. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated 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. Coordinate the addition of trade-specific information to coordination in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on 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. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
3. 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.
4. 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.
5. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.

- c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 - 6. 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.
 - 7. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."
- C. Coordination Drawing Process: Prepare coordination drawings in the following manner:
- 1. Schedule submittal and review of Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
 - 2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
 - 3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
 - 4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
 - 5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.
 - 6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
 - 7. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.
- D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
- 1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 - 2. File Preparation Format: DWG, operating in Microsoft Windows operating system.
 - 3. File Submittal Format: Submit or post coordination drawing files using PDF format.
 - 4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: Drawings are available in AutoCAD 2017 DWG format, operating in Microsoft Windows operating system.

- c. Contractor shall execute a data licensing agreement on form provided by the Architect.

1.7 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner 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. Owner name.
 3. Name of Architect.
 4. Date.
 5. Name of Contractor.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 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 Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. 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: AIA Document G716 or software-generated form with substantially the same content as indicated above, acceptable to Architect.
 1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven 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.
 1. The following Contractor-generated RFIs will be returned without action:

- 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.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 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 by Architect of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
1. Project name.
 2. Name of Contractor.
 3. Name of Architect.
 4. RFI number, including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Web-Based Project Software: Smartsheet project management software administered by District will be used for purposes of managing communication and/or documents during construction.
- B. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.
 1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.

3. Digital Drawing Software Program: Contract Drawings are available in AutoCAD 2017.
 4. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Architect.
 - a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Architect.
 5. The following digital data files will be furnished for each appropriate discipline:
 - a. Floor plans.
 - b. Reflected ceiling plans.
 - c. Interior elevations.
 - d. Building sections.
- C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

- A. General: Architect will schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Architect will record significant discussions and agreements achieved and distribute the meeting minutes to everyone concerned, including Owner, Contactor and Inspector of Record within three days of the meeting.
 4. Contractor to provide: 3 week look ahead schedule, submittal log, RFI log, actual percent complete, scheduled percent complete, workers on site, and work in progress.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Inspector of record, 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.

2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Procedures for processing field decisions and Change Orders.
 - h. Procedures for RFIs.
 - i. Procedures for testing and inspecting.
 - j. Procedures for processing Applications for Payment.
 - k. Distribution of the Contract Documents.
 - l. Submittal procedures.
 - m. Sustainable design requirements.
 - n. Preparation of Record Documents.
 - o. Use of the premises and existing building.
 - p. Work restrictions.
 - q. Working hours.
 - r. Owner'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.
 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Contractor to conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for 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 Architect and Inspector of Record 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. Options.

- c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - 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.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
- 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: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 10 days prior to the scheduled date of Substantial Completion.
- 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 - 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Inspector of Record; 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. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Requirements for completing sustainable design documentation.
 - f. Requirements for preparing operations and maintenance data.
 - g. Requirements for delivery of material samples, attic stock, and spare parts.
 - h. Requirements for demonstration and training.
 - 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. Coordination of separate contracts.
 - m. Owner's partial occupancy requirements.
 - n. Installation of Owner's furniture, fixtures, and equipment.
 - o. Responsibility for removing temporary facilities and controls.
4. Minutes: Architect will conduct meeting will record and distribute meeting minutes.
- E. Progress Meetings: Architect will conduct progress meetings at weekly intervals.
- 1. Attendees: In addition to representatives of Owner, Architect and Inspector of Record, 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: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Provide three-week look ahead at weekly meetings.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.

- 7) Site use.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of Proposal Requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, Inspector of Record 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 meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.

- 3) Status of submittals.
- 4) Deliveries.
- 5) Off-site fabrication.
- 6) Access.
- 7) Site use.
- 8) Temporary facilities and controls.
- 9) Work hours.
- 10) Hazards and risks.
- 11) Progress cleaning.
- 12) Quality and work standards.
- 13) Status of RFIs.
- 14) Proposal Requests.
- 15) Change Orders.
- 16) Pending changes.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

G. FORMS (attached to this section)

1. Warranty Form
2. Substitution Request Form

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

Warranty FormDate: _____ Project Name: San Luis Obispo High School New Classroom BuildingWARRANTY FOR _____, in Agreement between San Luis Coastal Unified School District
(Specification Section) (Owner)and _____
(the "Contractor") (Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows:

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within _____ after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Substitution Request FormTO: JOE WILCOX , KRUGER BENSON ZIEMER ARCHITECTS, INC.PROJECT: SAN LUIS OBISPO HIGH SCHOOL NEW CLASSROOM BUILDING

SPECIFIED ITEM: _____

Section	Page	Paragraph	Description
The undersigned requests consideration of the following:			
PROPOSED SUBSTITUTION: _____			

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents which the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. The proposed substitution does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering or architectural design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.
5. The proposed substitution will not result in an increase to the Contract Price or the Contract Time.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item.

Submitted by:

Signature _____

Firm _____

Address _____

Date _____

Telephone _____

Attachments: _____

Substitution Request Form Date: _____

Project Name: _____

For use by Architect

____ Accepted

____ Accepted as noted

____ Not Accepted

____ Received too late

By _____

Date _____

Remarks _____

END OF SECTION 013100

SECTION 013200 - 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. Construction schedule updating reports.
 - 3. Daily construction reports.
 - 4. Field condition reports.
 - 5. Unusual event reports.
- B. Related Requirements:
 - 1. Section 014000 "Quality Requirements" for schedule of tests and inspections.
 - 2. Section 012900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.

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 on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time [belongs to Owner] [is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date].
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file.
 - 2. PDF file.
 - 3. Two paper copies, of sufficient size to display entire period or schedule, as required.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- C. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
 - 3. Total Float Report: List of activities sorted in ascending order of total float.
- D. Construction Schedule Updating Reports: Submit with Applications for Payment.
- E. Daily Construction Reports: Submit at weekly intervals.
- F. Field Condition Reports: Submit at time of discovery of differing conditions.
- G. Unusual Event Reports: Submit at time of unusual event.

H. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

1.6 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, 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 construction activity in the network with other activities, and schedule them in proper sequence.

1.7 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

B. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting, using CPM scheduling.

1. In-House Option: Owner may waive requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

C. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

D. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Temporary Facilities: Indicate start and completion dates for the following as applicable:
 - a. Securing of approvals and permits required for performance of the Work.
 - b. Temporary facilities.
 - c. Construction of mock-ups, prototypes and samples.

- d. Owner interfaces and furnishing of items.
 - e. Regulatory agency approvals.
 - f. Punch list.
 - 3. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 4. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 - 5. Startup and Testing Time: Include no fewer than 5 days for startup and testing.
 - 6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's and Inspector of Record's administrative procedures necessary for certification of Substantial Completion.
 - 7. Punch List and Final Completion: Include not more than 10 days for completion of punch list items and Final Completion.
- E. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
- 1. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Use-of-premises restrictions.
 - e. Seasonal variations.
 - f. Environmental control.
 - 2. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Submittals.
 - b. Mockups.
 - c. Installation.
 - d. Tests and inspections.
 - e. Adjusting.
 - f. Curing.
 - g. Building flush-out.
 - h. Startup and placement into final use and operation.
 - 3. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.

- b. Completion of mechanical installation.
 - c. Completion of electrical installation.
 - d. Substantial Completion.
 - F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
 - G. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and the Contract Time.
 - H. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Final Completion percentage for each activity.
 - I. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
 - J. Distribution: Distribute copies of approved schedule to Architect, Inspector of Record, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.
- 1.8 CPM SCHEDULE REQUIREMENTS
- A. Prepare network diagrams using AON (activity-on-node) format.

- B. CPM Schedule: Prepare Contractor's Construction Schedule using a time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule, so it can be accepted for use no later than 10 days after date established for commencement of the Work.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.
- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Delivery.
 - d. Installation.
 - e. Testing and inspection.
 - f. Commissioning.
 - g. Punch list and Final Completion.
 - h. Activities occurring following Final Completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.

- E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports in PDF format showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Main events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports in PDF format. showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.

1.9 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. Approximate count of personnel at Project site.
 3. Equipment at Project site.
 4. Material deliveries.
 5. High and low temperatures and general weather conditions, including presence of rain or snow.
 6. Testing and inspection.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events.
 10. Stoppages, delays, shortages, and losses.
 11. Emergency procedures.
 12. Orders and requests of authorities having jurisdiction.
 13. Change Orders received and implemented.
 14. Construction Change Directives received and implemented.
 15. Services connected and disconnected.
 16. Equipment or system tests and startups.
 17. Partial completions and occupancies.

18. Substantial Completions authorized.

- B. Field Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- C. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
 - 1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

SECTION 013300 - 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:**

- 1. Submittal schedule requirements.
- 2. Administrative and procedural requirements for submittals.

B. Related Requirements:

- 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
- 2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
- 3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
- 4. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
- 5. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
- 6. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
- 7. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
- 8. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

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."

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 and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required 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.

1.5 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
1. Project name.
 2. Date.
 3. Name of Architect.
 4. Name of Contractor.
 5. Name of firm or entity that prepared submittal.
 6. Names of subcontractor, manufacturer, and supplier.
 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 8. Category and type of submittal.
 9. Submittal purpose and description.
 10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 11. Drawing number and detail references, as appropriate.
 12. Indication of full or partial submittal.

13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.
16. Signature of transmitter.

- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.6 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to Owner's web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
- 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 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, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. 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.

1.7 SUBMITTAL REQUIREMENTS

A. 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 unsuitable 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.
4. For equipment, include the following in addition to the above, as applicable:

- a. Wiring diagrams that show 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 concurrently with Samples.
- B. 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. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
 - a. Three opaque copies of each submittal. Architect will retain two copies; remainder will be returned.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
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. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.

4. Paper Transmittal: Include paper transmittal, including complete submittal information indicated.
 5. 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 Owner's property, are the property of Contractor.
 6. 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 one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 7. 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, but are not limited to, 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 one Sample sets; remainder will be returned.
 - 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.
- D. 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.

- E. 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.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include 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.
- G. Certificates:
 - 1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 - 2. 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.
 - 3. 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.
 - 4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
 - 5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
 - 6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:
 - 1. 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 substrate preparation and primers required.
 - 2. 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.
 - 3. 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.
 - 4. 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.
 - 5. 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.

6. 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:

- a. Name of evaluation organization.
- b. Date of evaluation.
- c. Time period when report is in effect.
- d. Product and manufacturers' names.
- e. Description of product.
- f. Test procedures and results.
- g. Limitations of use.

1.8 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 insufficient 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 file or one paper copy 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.

1.9 CONTRACTOR'S REVIEW

- A. Action Submittals 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. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include 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 received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.
 - 1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.
 - 2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- 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. Architect will return without review or discard submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

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SECTION 014000 - QUALITY REQUIREMENTS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection 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 quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Requirements:
 - 1. Section 012100 "Allowances" for testing and inspection allowances.

1.2 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, 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.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.

1. Mockups are used for one or more of the following:
 - a. Verify selections made under Sample submittals.
 - b. Demonstrate aesthetic effects.
 - c. Demonstrate the qualities of products and workmanship.
 - d. Demonstrate successful installation of interfaces between components and systems.
 - e. Perform preconstruction testing to determine system performance.
 2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
 3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) in accordance with 29 CFR 1910.7, by a testing agency accredited in accordance with NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
- I. 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.
- J. 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. Contractor's quality-control services do not include contract administration activities performed by Architect or Construction Manager.
- ### 1.3 CONFLICTING REQUIREMENTS
- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may 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 for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D. 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 a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.5 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
 - 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

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, telephone number, and email address 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. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. 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, telephone number, and email address 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, telephone number, and email address 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. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work 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.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
 - 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. 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.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor's Responsibilities:
 - a. Provide test specimens representative of proposed products and construction.

- b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
 - e. When testing is complete, remove test specimens and test assemblies; do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
- K. 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 of size indicated.
 - 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
 - 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
 - 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
 - 8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

1.8 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.

2. 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 Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Engage a qualified testing agency to perform quality-control services.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform duties of Contractor.
- 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 013300 "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. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify 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 inspection. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Delivery of samples to testing agencies.
 - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - 7. Security and protection for samples and for testing and inspection equipment at Project site.
- H. Coordination: 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 inspection.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
 - 1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
 - 2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.9 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in the Statement of Special Inspections, and as follows:
 - 1. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 2. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.

3. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
4. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
5. Retesting and reinspecting corrected Work.

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 Architect.
 4. Identification of testing agency or special inspector 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 Architect's reference during normal working hours.
 1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, 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 017300 "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 014000

SECTION 014200 - 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 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 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 and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

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.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- 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. Abbreviations and acronyms not included in this list shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States." The information in this list 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.
 - 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; 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 - BICSI, Inc.; 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. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CE - Conformite Europeenne; <http://ec.europa.eu/growth/single-market/ce-marking/>.
51. CEA - Canadian Electricity Association; www.electricity.ca.
52. CEA - Consumer Electronics Association; www.ce.org.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.pbmdf.com.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.

63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - CSA Group; www.csagroup.com.
65. CSA - CSA International; www.csa-international.org.
66. CSI - Construction Specifications Institute (The); www.csinet.org.
67. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
71. DHI - Door and Hardware Institute; www.dhi.org.
72. ECA - Electronic Components Association; (See ECIA).
73. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
74. ECIA - Electronic Components Industry Association; www.eciaonline.org.
75. EIA - Electronic Industries Alliance; (See TIA).
76. EIMA - EIFS Industry Members Association; www.eima.com.
77. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
78. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
79. ESTA - Entertainment Services and Technology Association; (See PLASA).
80. ETL - Intertek (See Intertek); www.intertek.com.
81. EVO - Efficiency Valuation Organization; www.evo-world.org.
82. FCI - Fluid Controls Institute; www.fluidcontrolsintstitute.org.
83. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
84. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
85. FM Approvals - FM Approvals LLC; www.fmglobal.com.
86. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
87. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridarooft.com.
88. FSA - Fluid Sealing Association; www.fluidsealing.com.
89. FSC - Forest Stewardship Council U.S.; www.fscus.org.
90. GA - Gypsum Association; www.gypsum.org.
91. GANA - Glass Association of North America; www.glasswebsite.com.
92. GS - Green Seal; www.greenseal.org.
93. HI - Hydraulic Institute; www.pumps.org.
94. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
95. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
96. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
97. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
98. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
99. IAS - International Accreditation Service; www.iasonline.org.
100. ICBO - International Conference of Building Officials; (See ICC).
101. ICC - International Code Council; www.iccsafe.org.
102. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
103. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
104. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
105. IEC - International Electrotechnical Commission; www.iec.ch.

106. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
107. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
108. IESNA - Illuminating Engineering Society of North America; (See IES).
109. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
110. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
111. IGSHA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
112. ILI - Indiana Limestone Institute of America, Inc.; www.ili.ai.com.
113. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
114. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
115. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
116. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
117. ISO - International Organization for Standardization; www.iso.org.
118. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
119. ITU - International Telecommunication Union; www.itu.int/home.
120. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
121. LMA - Laminating Materials Association; (See CPA).
122. LPI - Lightning Protection Institute; www.lightning.org.
123. MBMA - Metal Building Manufacturers Association; www.mbma.com.
124. MCA - Metal Construction Association; www.metalconstruction.org.
125. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
126. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
127. MHIA - Material Handling Industry of America; www.mhia.org.
128. MIA - Marble Institute of America; www.marble-institute.com.
129. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
130. MPI - Master Painters Institute; www.paintinfo.com.
131. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
132. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
133. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
134. NADCA - National Air Duct Cleaners Association; www.nadca.com.
135. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
136. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
137. NBI - New Buildings Institute; www.newbuildings.org.
138. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
139. NCMA - National Concrete Masonry Association; www.ncma.org.
140. NEBB - National Environmental Balancing Bureau; www.nebb.org.
141. NECA - National Electrical Contractors Association; www.necanet.org.
142. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
143. NEMA - National Electrical Manufacturers Association; www.nema.org.
144. NETA - InterNational Electrical Testing Association; www.netaworld.org.
145. NFHS - National Federation of State High School Associations; www.nfhs.org.

146. NFPA - National Fire Protection Association; www.nfpa.org.
147. NFPA - NFPA International; (See NFPA).
148. NFRC - National Fenestration Rating Council; www.nfrc.org.
149. NHLA - National Hardwood Lumber Association; www.nhla.com.
150. NLGA - National Lumber Grades Authority; www.nlga.org.
151. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
152. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
153. NRCA - National Roofing Contractors Association; www.nrca.net.
154. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
155. NSF - NSF International; www.nsf.org.
156. NSPE - National Society of Professional Engineers; www.nspe.org.
157. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
158. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
159. NWFA - National Wood Flooring Association; www.nwfa.org.
160. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
161. PDI - Plumbing & Drainage Institute; www.pdionline.org.
162. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
163. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
164. RFCI - Resilient Floor Covering Institute; www.rfci.com.
165. RIS - Redwood Inspection Service; www.redwoodinspection.com.
166. SAE - SAE International; www.sae.org.
167. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
168. SDI - Steel Deck Institute; www.sdi.org.
169. SDI - Steel Door Institute; www.steeldoor.org.
170. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
171. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
172. SIA - Security Industry Association; www.siaonline.org.
173. SJI - Steel Joist Institute; www.steeljoist.org.
174. SMA - Screen Manufacturers Association; www.smainfo.org.
175. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
176. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
177. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
178. SPIB - Southern Pine Inspection Bureau; www.spib.org.
179. SPRI - Single Ply Roofing Industry; www.spri.org.
180. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
181. SSINA - Specialty Steel Industry of North America; www.ssina.com.
182. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
183. STI - Steel Tank Institute; www.steeltank.com.
184. SWI - Steel Window Institute; www.steelwindows.com.
185. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
186. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
187. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
188. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.

189. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
190. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
191. TMS - The Masonry Society; www.masonrysociety.org.
192. TPI - Truss Plate Institute; www.tpinst.org.
193. TPI - Turfgrass Producers International; www.turfgrasssod.org.
194. TRI - Tile Roofing Institute; www.tilerroofing.org.
195. UL - Underwriters Laboratories Inc.; www.ul.com.
196. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
197. USAV - USA Volleyball; www.usavolleyball.org.
198. USGBC - U.S. Green Building Council; www.usgbc.org.
199. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
200. WA - Wallcoverings Association; www.wallcoverings.org.
201. WASTEC - Waste Equipment Technology Association; www.wastec.org.
202. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
203. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
204. WDMA - Window & Door Manufacturers Association; www.wdma.com.
205. WI - Woodwork Institute; www.wicnet.org.
206. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
207. 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/fdsys.
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.
 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. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
 2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
 3. DSCC - Defense Supply Center Columbus; (See FS).
 4. FED-STD - Federal Standard; (See FS).
 5. 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.
 6. MILSPEC - Military Specification and Standards; (See DOD).
 7. USAB - United States Access Board; www.access-board.gov.
 8. 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. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
 2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
 3. CDHS; California Department of Health Services; (See CDPH).

4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. DSA; Division of the State Architect; www.dgs.ca.gov/DSA.
7. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
8. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservation.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

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SECTION 015000 - 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 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Inspector Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- D. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. 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 requirements for replacing water-damaged Work.
 2. Indicate sequencing of work that requires water, such as plastering, 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. Indicate methods to be used to avoid trapping water in finished work.
- 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. 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.
- F. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
1. Methods used to meet the goals and requirements of the Owner.
 2. Concrete cutting method(s) to be used.
 3. Location of construction devices on the site.
 4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
 5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
 6. Indicate locations of sensitive equipment areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

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 NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

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 Owner'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 6 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. Provide galvanized-steel bases for supporting posts. Cover all bases with sandbags
- B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
- D. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.

2.2 TEMPORARY FACILITIES

- A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Contractor's Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
 - 3. Access to bottled or filtered water.
 - 4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 - 5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Inspector's Field Office: Of sufficient size to accommodate needs of Project Inspector office activities; 150 square feet minimum. Furnish and equip offices as follows:
 - 1. Tile, sheet, or carpet flooring.
 - 2. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 - 3. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height. Provide exterior light at door.
 - 4. Adequate electrical outlets.
 - 5. Furniture required for Project-site documents, including the following:

- a. Desk, minimum 32 x 66 inches.
 - b. Desk chair and 2 side chairs.
 - c. One 4-drawer file, legal or letter type as requested.
 - d. Four 4-foot long bookshelves.
 - e. One 36 x 72-inch drafting table with stool and fluorescent or LED drafting lamp.
 - f. One plan rack.
 - 6. Equipment required, including the following:
 - a. One combination printer/copier/scanner.
 - b. One 3 x 6 foot tackboard.
 - c. Two wastebaskets; one for trash and one for recyclables.
 - d. One outdoor thermometer.
 - 7. Access to bottled water.
- D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
- 1. Store combustible materials apart from building.

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: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. 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.
 - 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 Owner's property.

3.2 INSTALLATION, 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.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- 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.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash 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.
 - 1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.
- D. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.
 - 1. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation for personnel when requested by health authorities.
- E. Drinking-Water Facilities: Provide containerized, tap-dispenser, bottled-water drinking-water units, including paper supply.
- F. Temporary 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.
 - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- G. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 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.
- H. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- 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.
- J. Telephone Service:
 - 1. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
- K. Electronic Communication Service: Owner will provide secure WiFi wireless connection to internet with provisions for access by Inspector.
- L. Project Computer: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications. Equip computer with not less than the following:
 - 1. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
 2. If allowed by Owner, utilize designated area within existing building for temporary field offices.
 3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. 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.
 3. Coordinate with Owner prior to working outside of construction staging and storage areas.
- C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- D. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs 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.
- F. 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 017300 "Execution."

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 written permission from adjacent property owner to access property for that purpose.
- 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.
1. Comply with work restrictions specified in Section 011000 "Summary."

- C. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people 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. Furnish one set of keys to Owner.
- D. 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 workday.
- E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- F. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
- G. 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 in construction areas. Comply with additional limits on smoking specified in other Sections.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with 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.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Controlled Construction Period:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 - 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 and require replacing.
- 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 Architect.
- c. Remove and replace 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. Owner reserves right to take possession of Project identification signs.
 2. Prior to Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
 - a. Replace air filters and clean inside of ductwork and housings.
 - b. Replace lamps burned out or noticeably dimmed by hours of use.
 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

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SECTION 015100 - FIELD ENGINEERING**PART 1 – GENERAL****1.01 DESCRIPTION**

- A. Provide materials, equipment, and transportation and perform labor as required for construction surveying.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specifications, apply to this Section.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 312000: Site Grading
- B. Section 321313: Site Concrete

1.04 STANDARD SPECIFICATIONS

- A. Construction materials and methods shall be in accordance with the *Standard Specifications for Public Works Construction, 2021 edition (SSPWC)*, published by Building News, Inc., except as modified or otherwise specified herein (hereinafter the Standard Specifications).
- B. In case of conflict between the Standard Specifications and the project specifications, the project specifications shall govern.

1.05 REGULATORY REQUIREMENTS

- A. Construction shall comply with the *California Code of Regulations, Title 24, Part 2* (the *California Building Code*), most recent effective edition.
- B. Construction shall comply with applicable health and safety laws and standards including rules, orders and regulations of the *State of California Construction and General Industry Safety Orders*, the *Occupational Safety and Health Act of 1970*, and the *Construction Safety Act*.

1.06 SUBMITTALS

- A. Provide submittals according to the Conditions of the Contract and Division 1 "Submittal Procedures" section.
- B. Refer to "Submittal Requirements and Schedule" at the end of this Section.

1.07 RECORD DOCUMENTS

- A. Comply with requirements of Division 1, "Project Record Documents" section.

1.08 QUALITY ASSURANCE

- A. Retain a Land Surveyor, registered in the State of California, and acceptable to Architect / Engineer and Owner.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 SURVEY CONTROL

- A. Confirm location, condition, datum, horizontal and vertical control data for survey control points given on the Drawings, with the Topographic Mapping Surveyor.
 - 1. Protect survey control points during construction.
- B. Establish additional survey control points throughout the work site in locations that will not be disturbed by construction activities.
 - 1. Locate control points such that there are at least two readily useable for each individual work area requiring surveying.
 - 2. Record locations of control points on Record Documents, including description and horizontal and vertical survey data.
- C. Survey horizontal and vertical locations of existing buried conduits, pipelines and structures to be joined by, or which may conflict with, new construction and which have been exposed by potholing pursuant to requirements of individual technical specification sections; while exposed, observe and record conduit / pipe size and material. Redline this information to scale on a hardcopy of the applicable plan (or plan and profile) and provide to the Engineer for review and resolution of conflicts, if any. Allow a minimum of five (5) working days for review; more time may be required depending on the completeness of information provided and on the extent of the conflicts.
- D. Layout and provide construction stakes for the work, including:
 - 1. Line and grade control for rough grading operations, including area grading, cut and fill slopes, subgrade for building pads and pavements.
 - 2. Line and grade control for finish grading including drainage swales.
 - 3. Line and grade control and grade certification prior to backfill for gravity pipelines and related structures.

4. Where called for on the Drawings, grade control and grade certification prior to backfill for pressure pipelines.
 5. Line and grade control for concrete flatwork, walks, ramps, stairs, curbs, gutters, and walls.
 6. Line and grade control for A.C. and concrete pavements.
- E. Survey and certify finish surface of completed building pad prior to any work involving plumbing, utilities, or foundations.
- F. Survey forms for concrete walks and ramps prior to ordering concrete to ensure that accessibility requirements for slope and cross-slope will be conformed with.
- G. Where design longitudinal gradient is less than 1% (1/8 inch per foot) survey gutter or curb and gutter forms prior to ordering concrete to ensure that design slope is being achieved.
- H. For asphalt concrete and concrete pavement, prior to scheduling placement of pavement confirm that surface of aggregate base course has been constructed to the design elevation and slope within tolerances specified in Section 02310, Subsection 3.03B.
- I. Provide record surveying pursuant to requirements of individual technical specification sections.

END OF SECTION

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SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION**PART 1 - GENERAL****1.1 SUMMARY**

- A. The Work of this Section Includes: General protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Requirements:
 - 1. Section 015000 "Temporary Facilities and Controls" for temporary controls, utilities, support facilities, temporary site fencing, and, if applicable, temporary erosion and sedimentation controls if not specified in Section 311000 "Site Clearing".
 - 2. Section 311000 "Site Clearing" for removing existing trees and shrubs and for temporary erosion- and sedimentation-control measures if not specified in Section 015000 "Temporary Facilities and Controls".

1.2 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape or the average of the smallest and largest diameters at a height 6 inches (above the ground for trees up to and including 4-inch size at this height and as measured at a height of 12 inches above the ground for trees larger than 4-inch size).
- B. Caliper (DBH): Diameter breast height; diameter of a trunk as measured by a diameter tape or the average of the smallest and largest diameters at a height 54 inches above the ground line for trees with caliper of 8 inches or greater as measured at a height of 12 inches above the ground.
- 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.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. General protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction
- B. Shop Drawings:

1. Include plans, elevations, and sections showing trees and plants to be protected, locations of protection-zone fencing and signage, and the relationship between equipment-movement routes and material storage locations with protection zones.
 2. Detail fabrication and assembly of protection-zone fencing and signage.
 3. Indicate extent of utility boring and trenching by hand or with air spade within protection zones.
 4. Include existing irrigation system that will be used to water plants.
- C. Tree-Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
1. Species and size of tree.
 2. Location on site plan. Include unique identifier for each.
 3. Reason for pruning.
 4. Description of pruning to be performed.
 5. Description of maintenance following pruning.
- D. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
- E. Mitigation Requirements: As r developed by arborist, for mitigation of damage to trees and other plantings. Include the following:
1. Local ordinances governing tree mitigation.
 2. Standards established under the approved tree mitigation report developed by the arborist.
 3. "Digital Guide for Plant Appraisal" by Council of Tree and Landscape Appraisers.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For arborist and tree service firm.
- B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction in accordance with 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.

1.5 QUALITY ASSURANCE

- A. Arborist Qualifications: Certified Arborist as certified by ISA, Board Certified Master Arborist as certified by ISA, Certified Arborist-Municipal Specialist as certified by ISA, Licensed arborist in jurisdiction where Project is located, Current member of ASCA, or 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.

1.6 FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Moving or 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.
- 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.
- D. Take precautions to protect plants from airborne contaminants, such as paint or fireproofing overspray.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Ground or shredded bark.
 2. Size Range: [3 inches (76 mm) maximum, 1/2 inch (13 mm) minimum] <Insert size range>.
 3. Color: Natural.
- B. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements:
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 posts; with 0.177-inch- diameter top and bottom tension wires; with tie wires, hog ring ties, and other accessories for a complete fence system.
 - a. Height: 48 inches minimum.
 2. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi; secured with plastic bands or galvanized-steel or stainless steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches apart.
 - a. Height: 48 inches minimum
 - b. Color: High-visibility orange, nonfading.
 3. Gates: Single-swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width 36 inches.
- C. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering.

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, endorsed 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. Flag or 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.

3.3 TREE PROTECTION

- A. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.
 - 1. Apply 2-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

3.4 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 F567 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 Architect.
 - 3. Access Gates: Install as required; 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.
 - 4. Plastic Fencing: Stretch fabric taut and secure to posts without bows or sags.
- B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 20 ft. 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 hydration of plants to assure plant survival.

- E. Maintain protection-zone fencing and signage in good condition as acceptable to Architect 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.

3.5 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones in accordance with requirements in Section 312000 "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.

3.6 ROOT PRUNING

- A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:
 - 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: Do not paint cut root ends.
 - 3. Temporarily support and protect roots from damage until they are permanently covered with soil.
 - 4. Cover exposed roots with burlap and water regularly.
 - 5. Backfill as soon as possible in accordance with requirements in Section 312000 "Earth Moving."
- B. Root Pruning at Edge of Protection Zone: Prune tree roots 12 inches outside of the protection zone by cleanly cutting all roots to the depth of the required excavation.
- C. 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.

3.7 CROWN PRUNING

- A. 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 in accordance with ANSI A300 (Part 1).
- B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.
- C. Cut branches with sharp pruning instruments; do not break or chop.
- D. Do not paint or apply sealants to wounds.
- E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.
- F. Chip removed branches and dispose of off-site.

3.8 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.

3.9 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.

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 Architect.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours in accordance with arborist's written instructions.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.
- 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 Architect 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 4 inches or smaller in caliper size.
 - 2. Large Trees: Provide one new tree(s) of 6-inch caliper size for each tree being replaced that measures more than 6 inches in caliper size.
 - a. Species: Same species as those being replaced.

END OF SECTION 015639

SECTION 01 5719 – INDOOR AIR QUALITY (IAQ) MANAGEMENT**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. Special requirements for Indoor Air Quality (IAQ) management during construction operations.
 - a. Control of emissions during construction.

1.3 Moisture control during construction.

- 1. Procedures for testing baseline IAQ. Baseline IAQ requirements specify maximum indoor pollutant concentrations for acceptance of the facility.

B. Related Sections:

- 1. Section 013100 "Project Management and Coordination" for meetings and project coordination.
- 2. Section 014000 "Quality Requirements" for quality control procedures.
- 3. Section 017700 "Closeout Procedures" for final cleaning and submittals.

1.4 DEFINITIONS

- A. Definitions pertaining to sustainable development: As defined in ASTM E2114.
- B. Adequate Ventilation: Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of particulates, dust, fumes, vapors, or gases.
- C. Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173, requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261. Throughout this specification, hazardous material includes hazardous chemicals.

1. Hazardous materials include: pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).
 - D. Indoor Air Quality (IAQ): The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the relative quality of air in a building with respect to contaminants and hazards and is determined by the level of indoor air pollution and other characteristics of the air, including those that impact thermal comfort such as air temperature, relative humidity and air speed.
 - E. Interior Final Finishes: Materials and products that will be exposed at interior, occupied spaces; including flooring, wallcovering, finish carpentry, and ceilings.
 - F. Packaged Dry Products: Materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging; including carpets, resilient flooring, ceiling tiles, and insulation.
 - G. Wet Products: Materials and products installed in wet form, including paints, sealants, adhesives, special coatings, and other materials which require curing.
- 1.5 PRECONSTRUCTION MEETING
- A. After award of Contract and prior to the commencement of the Work, schedule and conduct a meeting with Owner and Architect to discuss the proposed IAQ Management Plan and to develop mutual understanding relative to details of environmental protection.
- 1.6 SUBMITTALS
- A. Indoor Air Quality (IAQ) Management Plan: Not less than 10 days before Pre-construction meeting, prepare and submit an IAQ Management Plan including, but not limited to the following:
 1. Procedures for control of emissions during construction.
 - a. Identify schedule for application of interior finishes.
 2. Procedures for moisture control during construction.
 - a. Identify porous materials and absorptive materials.
 - b. Identify schedule for inspection of stored and installed absorptive materials.
 3. Revise and resubmit Plan as required by Owner.
 - a. Approval of Contractor's IAQ Management Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations.
 - B. Product Data:

1. Submit product data for filtration media used during construction and during operation. Include Minimum Efficiency Reporting Value (MERV).
2. Material Safety Data Sheets: Submit MSDSs for inclusion in Operation and Maintenance Manual for the following products. Coordinate with Section 017823.
 - a. Adhesives.
 - b. Floor and wall patching/leveling materials.
 - c. Caulking and sealants.
 - d. Insulating materials.
 - e. Fireproofing and firestopping.
 - f. Paint.
 - g. Clear finish for wood surfaces.
 - h. Lubricants.
 - i. Cleaning products.
3. Submit product certifications for all composite wood and agrifiber products confirming they contain no added urea-formaldehyde resins.

C. Photographs:

1. Submit a minimum of 6 photographs (electronic files) taken at 3 different times during construction (total of 18 photographs) that illustrate implementation of IAQ Management Plan procedures. Photographs shall be dated and include annotations describing IAQ Management procedures that are shown.

PART 2 - PRODUCTS

2.1 ADHESIVES AND SEALANTS

- A. All adhesives and sealants used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) must comply with the following limits for VOC content when calculated according to 40 CFR 50, Subpart D (EPA method 24):
1. Wood Glues: 30 g/L
 2. Millwork and Casework Adhesives: 20 g/L
 3. Casework Sealant: 50 g/L
 4. Metal to Metal Adhesives: 30 g/L
 5. Adhesives for Porous Materials (Except Wood): 50 g/L
 6. Subfloor Adhesives: 50 g/L
 7. Plastic Foam Adhesives: 50 g/L
 8. Carpet Adhesives: 50g/L
 9. Carpet Pad Adhesives: 50 g/L
 10. Carpet Seam Sealer: 50 g/L
 11. VCT and Sheet Vinyl Adhesives: 50 g/L
 12. Cove Base Adhesives: 50 g/L
 13. Rubber Floor Adhesives: 60 g/L
 14. Wood Floor Adhesives: 100 g/L

15. Ceramic Tile Adhesives: 65 g/L
16. Gypsum Board and Panel Adhesives: 50 g/L
17. Multipurpose Construction Adhesives: 70 g/L
18. General Contact Adhesive: 80 g/L
19. Special Purpose Contact Adhesive: 250 g/L
20. Structural Glazing Adhesives and Compounds: 100 g/L
21. Structural Wood Member Adhesive: 140 g/L
22. Top & Trim Adhesive: 250 g/L
23. Silicone Sealant: 50 g/L
24. Pipe Thread Sealant: 50 g/L
25. Plastic Cement Welding Compounds: 250 g/L
26. ABS Welding Compounds: 325 g/L
27. CPVC Welding Compounds: 490 g/L
28. PVC Welding Compounds: 510 g/L
29. Adhesive Primer for Plastic: 250 g/L
30. Architectural Non-Porous Sealants and Sealant Primers: 250 g/L
31. Architectural Porous Sealants and Sealant Primers: 775 g/L
32. Single-Ply Roofing Membrane Adhesives: 250 g/L
33. General Purpose Mist Spray Aerosol Adhesives: 65% VOCs by weight
34. General Purpose Web Spray Aerosol Adhesives: 55% VOCs by weight
35. Special Purpose Aerosol Adhesives (all types): 70% VOCs by weight

- B. Interior sealants shall not contain: mercury, butyl rubber, neoprene, SBT (styrene butadi-ene rubber), or nitrile.
- C. Sealants and glazing compounds formulated with aromatic solvents (organic solvent with a benzene ring in its molecular structure) fibrous talc or asbestos, formaldehyde, halo-genated solvents, mercury, lead, cadmium, hexavalent chromium, or their components shall not be used.
- D. Adhesives used to apply laminates, whether shop-applied or field-applied, shall contain no urea formaldehyde.

2.2 PAINTS AND COATINGS

- A. Interior Paints and Coatings: For interior field-applied applications, use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24) and the chemical restrictions (Restricted Components listed below) of Green Seal Standard GS-11, Paints and Coatings, Third Edition, August 17, 2011; Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997; and South Coast Air Quality Management District Rule 1113, Architectural Coatings, rules in effect on September 6, 2013, as follows:
1. Primers, Sealers, Undercoaters: Not more than 200 g/L of VOC per liter of coating less water and exempt compounds, including pigments.
 2. Flat Paints and Coatings: Not more than 50 grams of VOC per liter of coating less water and exempt compounds, including pigments.

3. Non-Flat Paints and Coatings: Not more than 50 grams of VOC per liter of coating less water and exempt compounds, including pigments.
4. High Gloss Paints and Coatings: Not more than 150 grams of VOC per liter of coating less water and exempt compounds, including pigments. High Gloss Coatings are coatings that register a gloss of 70 or above on a 60-degree meter according to ASTM Test Method D 523 as specified in paragraph (e)(6).
5. Water-Based Polychromatic Finish Coatings: Not more than 150 g/L (150 g/L for primer and flat polychromatic paint).
6. Anti-Corrosive Coatings: Not more than 250 grams of VOC per liter of coating less water and exempt compounds.
7. Sanding Sealers: Not more than 50 grams of VOC per liter of coating less water and exempt compounds.
8. Waterproofing Sealers: Not more than 250 grams of VOC per liter of coating less water and exempt compounds.
9. Concrete Slab Sealers: Not more than 100 grams of VOC per liter of coating less water and exempt compounds.
10. Polyurethanes: Not more than 100 grams of VOC per liter of coating less water and exempt compounds.
11. Stains: Not more than 250 grams of VOC per liter of coating less water and exempt compounds.
12. Interior paints shall not contain antimicrobial additives (such as fungicides and biocides).
13. Aromatic Compounds: Paints and coatings shall not contain more than 1% (by weight) total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
14. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein
 - b. Acrylonitrile
 - c. Aniline dyes
 - d. Antimony
 - e. Benzene
 - f. Butyl benzyl phthalate
 - g. Cadmium
 - h. Di (2-ethylhexyl) phthalate
 - i. Di-n-butyl phthalate
 - j. Di-n-octyl phthalate
 - k. 1,2-dichlorobenzene
 - l. Diethyl phthalate
 - m. Dimethyl phthalate
 - n. Ethylbenzene
 - o. Formaldehyde
 - p. Hexavalent chromium
 - q. Isophorone
 - r. Lead
 - s. Mercury
 - t. Methyl ethyl ketone
 - u. Methyl isobutyl ketone
 - v. Methylene chloride

- w. Naphthalene
- x. Toluene (methylbenzene)
- y. 1,1,1-trichloroethane
- z. Vinyl chloride
- aa. Xylene

2.3 COMPOSITE WOOD AND AGRIFIBER BINDERS

- A. All composite wood, agrifiber products, and wood doors shall contain no added ureaformaldehyde binder resins.

PART 3 - EXECUTION

3.1 IAQ MANAGEMENT – EMISSIONS CONTROL

- A. During construction operations, follow the recommendations in SMACNA IAQ Guidelines for Occupied Buildings under Construction.
- B. HVAC Protection:
 - 1. Seal return registers during construction operations.
 - 2. Provide temporary exhaust during construction operations.
 - 3. To the greatest extent possible, isolate and/or shut down the return side of the HVAC system during construction. When ventilation system must be operational during construction activities, provide temporary filters.
 - a. Provide filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 as determined by ASHRAE 52.2 during construction. Replace filters prior to occupancy with those recommended in Mechanical Plans. Coordinate with work of Division 23 Heating Ventilating and Air Conditioning (HVAC).
- C. Source Control: Provide low and zero VOC materials as specified.
- D. Pathway Interruption: Isolate areas of work as necessary to prevent contamination of clean or occupied spaces. Provide pressure differentials and/or physical barriers to protect clean or occupied spaces.
- E. Housekeeping: During construction, maintain project and building products and systems to prevent contamination of building spaces.
- F. Scheduling: Schedule construction operations involving wet products prior to packaged dry products to the greatest extent possible.
- G. Provide adequate ventilation during and after installation of interior wet products and interior final finishes.

- H. Flush-Out: After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total air volume of 14,000 cu.ft. of outdoor air per sq.ft. of floor area while maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60%.

1. Flush out to be accomplished in 9 days maximum. Estimated 4000 CFM of supplemental conditioned fresh air required.

3.2 IAQ MANAGEMENT – MOISTURE CONTROL

A. Housekeeping:

1. Keep materials dry. Protect stored on-site and installed absorptive materials from moisture damage.
2. Verify that installed materials and products are dry prior to sealing and weatherproofing the building envelope.
3. Install interior absorptive materials only after building envelope is sealed and weatherproofed.

B. Inspections: Document and report results of inspections; state whether or not inspections indicate satisfactory conditions.

1. Examine materials for dampness as they arrive. If acceptable to Architect/Owner, dry damp materials completely prior to installation; otherwise, reject materials that arrive damp.
2. Examine materials for mold as they arrive and reject materials that arrive contaminated with mold.
3. Inspect stored and installed absorptive materials regularly for dampness and mold growth. Inspect after each rain event.
 - a. Where stored on-site or installed absorptive materials become wet, notify Architect and Owner. Inspect for damage. If acceptable to Architect/Owner, dry completely prior to closing in assemblies; otherwise, remove and replace with new materials.
4. Basement: Monitor basement and crawlspace humidity, and dehumidify when relative humidity is greater than 85 percent for more than 2 weeks or at the first sign of mold growth.
5. Site drainage: Verify that final grades of site work and landscaping drain surface water and ground water away from the building.
6. Weather-proofing: Inspect moisture control materials as they are being installed. Include the following:
 - a. Air barrier: Verify air barrier is installed without punctures and/or other damage. Verify air barrier is sealed completely.
 - b. Flashing: Verify correct shingling of the flashing for roof, walls, windows, doors, and other penetrations.
 - c. Insulation layer: Verify insulation is installed without voids.
 - d. Roofing: In accordance with ASTM D7186 Standard Practice for Quality Assurance Observation of Roof Construction and Repair.

7. Plumbing: Verify satisfactory pressure test of pipes and drains is performed before closing in and insulating lines.

C. Schedule:

1. Schedule work such that absorptive materials, including but not limited to porous insulations, paper-faced gypsum board, ceiling tile, and finish flooring, are not installed until they can be protected from rain and construction-related water.
2. Weather-proof as quickly as possible. Schedule installation of moisture-control materials, including but not limited to, air barriers, flashing, exterior sealants and roofing, at the earliest possible time.

END OF SECTION 01 5719

SECTION 016000 - 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 comparable products.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for Contractor requirements related to Owner-furnished products.
 - 2. Section 012500 "Substitution Procedures" for requests for substitutions.
 - 3. Section 014200 "References" for applicable industry standards for products specified.
 - 4. Section 01770 "Closeout Procedures" for submitting warranties.

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. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, 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 single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

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.
 1. Resolution of Compatibility Disputes between Multiple Contractors:
 - a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- 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. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.5 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 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 that products are undamaged and properly protected.
- C. Storage:
 1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
 2. Store products to allow for inspection and measurement of quantity or counting of units.
 3. Store materials in a manner that will not endanger Project structure.

4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 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 standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.
- 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 in the Project Manual, 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 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 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. Owner reserves the right to limit selection to products with warranties meeting 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. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."

- b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
- 5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
- 6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.
 - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
- 7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "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 012500 "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 a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.

1. Select products for which sustainable design documentation submittals are available from manufacturer.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."
 1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
 2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.
- D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

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SECTION 017300 - 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, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner's portion of the Work.
6. Coordination of Owner-installed products.
7. Progress cleaning.
8. Starting and adjusting.
9. Protection of installed construction.

- B. Related Requirements:

1. Section 011000 "Summary" for coordination of Owner-furnished products, Owner-performed work, and limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.3 DEFINITIONS

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

1.4 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.

1. Prior 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. Inform Architect and Inspector of scheduled meeting. 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 affected by cutting and patching operations.
2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. Cutting and Patching Plan: Submit plan describing procedures at least **10** days prior to the time cutting and patching will be performed. Include the following information:
 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 2. 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.
 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 4. Dates: Indicate when cutting and patching will be performed.
 5. 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.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.6 QUALITY ASSURANCE

- A. 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, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect 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. Plumbing piping systems.
 - e. Mechanical systems piping and ducts.
 - f. Control systems.
 - g. Communication systems.
 - h. Fire-detection and -alarm systems.
 - i. Electrical wiring systems.
 - j. Operating systems of special construction.
 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 but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Equipment supports.
 - d. Piping, ductwork, vessels, and equipment.
 - e. 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 Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

- 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. Use materials that are not considered hazardous.
- C. 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 Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

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, gas service piping, 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.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine 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, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 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 Owner 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, submit a request for information to Architect and Inspector in accordance with requirements in Section 013100 "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 existing conditions. If discrepancies are discovered, notify Architect and Inspector promptly.
- B. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, 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.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Inspector. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Inspector before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

3.5 INSTALLATION

- A. 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.
 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. 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 of type expected for Project.
- 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: 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 portions of the 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 with manufacturer.
 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by 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, as judged by Architect. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.
 1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 CUTTING AND PATCHING

- A. 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 to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials 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 in accordance with requirements in Section 011000 "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. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. 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.
 6. Proceed with patching after construction operations requiring cutting are complete.
- H. 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, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
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 eliminate 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, corner to corner of wall and edge to edge of ceiling. 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.
 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.
- I. 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 COORDINATION OF OWNER'S PORTION OF THE WORK

- A. Site Access: Provide access to Project site for Owner's construction personnel.
 - 1. Provide temporary facilities required for Owner-furnished, Contractor-installed products.
 - 2. Refer to Section 011000 "Summary" for other requirements for Owner-furnished, Contractor-installed products
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. 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: 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 015000 "Temporary Facilities and Controls."
- 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.
- 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 ensure 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 019113 "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 014000 "Quality Requirements."

3.10 PROTECTION AND REPAIR 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. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

- C. 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.
- D. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

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SECTION 017419 - 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.

1.3 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 7 days of date established for commencement of the Work.

1.6 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:
 1. Material category.
 2. Generation point of waste.
 3. Total quantity of waste in tons.
 4. Quantity of waste salvaged, both estimated and actual in tons.
 5. Quantity of waste recycled, both estimated and actual in tons.
 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- 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. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- 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 refrigerant recovery technician.
- H. 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.
- I. Refrigerant Recovery: Comply with requirements in Section 024116 "Structure Demolition" for refrigerant recovery submittals.

1.7 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Comply with requirements in Section 024116 "Structure Demolition."
- B. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

1.8 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work in compliance with Section 024116 "Structure Demolition."
 - 2. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 3. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 4. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there were no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:
 - 1. Total quantity of waste.
 - 2. Estimated cost of disposal (cost per unit). Include transportation and tipping fees and cost of collection containers and handling for each type of waste.
 - 3. Total cost of disposal (with no waste management).
 - 4. Revenue from salvaged materials.
 - 5. Revenue from recycled materials.
 - 6. Savings in transportation and tipping fees by donating materials.
 - 7. Savings in transportation and tipping fees that are avoided.

8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of [50] [75] <Insert number> percent by weight of total nonhazardous 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. Facilitate recycling and salvage of materials[.], including the following:]

1. Demolition Waste:
 - a. Asphalt paving.
 - b. Concrete.
 - c. Concrete reinforcing steel.
 - d. Wood studs.
 - e. Wood joists.
 - f. Plywood and oriented strand board.
 - g. Wood paneling.
 - h. Wood trim.
 - i. Structural and miscellaneous steel.
 - j. Rough hardware.
 - k. Roofing.
 - l. Insulation.
 - m. Doors and frames.
 - n. Door hardware.
 - o. Windows.
 - p. Glazing.
 - q. Gypsum board.
 - r. Acoustical tile and panels.
 - s. Carpet.
 - t. Carpet pad.
 - u. Equipment.
 - v. Cabinets.
 - w. Plumbing fixtures.
 - x. Piping.
 - y. Supports and hangers.
 - z. Valves.
 - aa. Mechanical equipment.
 - bb. Refrigerants.
 - cc. Electrical conduit.
 - dd. Copper wiring.

- ee. Lighting fixtures.
- ff. Lamps.
- gg. Ballasts.
- hh. Electrical devices.
- ii. Switchgear and panelboards.

2. Construction Waste:

- a. Lumber.
- b. Wood sheet materials.
- c. Wood trim.
- d. Metals.
- e. Roofing.
- f. Insulation.
- g. Carpet and pad.
- h. Gypsum board.
- i. Piping.
- j. Electrical conduit.
- k. 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.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Wood pallets.
 - 8) Plastic pails.
- l. Construction Office Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials:
 - 1) Paper.
 - 2) Aluminum cans.
 - 3) Glass containers.

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 015000 "Temporary Facilities and Controls."
- B. 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.
- C. 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 and recycled.
 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Comply with requirements in Section 024116 "Structure Demolition" for salvaging demolition waste.
- B. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- C. Salvaged Items for Sale or Donation: Not permitted on Project site.
- D. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
 1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area on-site designated by Owner.
 5. Protect items from damage during transport and storage.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.4 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
- C. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- D. Metals: Separate metals by type.
 - 1. Structural Steel: Stack members according to size, type of member, and length.
 - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- E. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- F. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

- G. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- H. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.
- I. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
 - 1. Store clean, dry carpet and pad in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- J. Carpet Tile: Remove debris, trash, and adhesive.
 - 1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- K. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.
- L. Conduit: Reduce conduit to straight lengths and store by material and size.
- M. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
- D. Paint: Seal containers and store by type.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.

3.7 ATTACHMENTS

- A. Form CWM-1 for construction waste identification.
- B. Form CWM-2 for demolition waste identification.
- C. Form CWM-3 for construction waste reduction work plan.
- D. Form CWM-4 for demolition waste reduction work plan.
- E. Form CWM-5 for cost/revenue analysis of construction waste reduction work plan.
- F. Form CWM-6 for cost/revenue analysis of demolition waste reduction work plan.
- G. Form CWM-7 for construction waste reduction progress report.
- H. Form CWM-8 for demolition waste reduction progress report.

END OF SECTION 017419

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FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION

MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED* (A)	EST. WASTE - % (B)	TOTAL EST. QUANTITY OF WASTE* (C = A x B)	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							

* Insert units of measure.

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FORM CWM-2: DEMOLITION WASTE IDENTIFICATION

MATERIAL DESCRIPTION	EST. QUANTITY	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Asphaltic Concrete Paving				
Concrete				
Brick				
CMU				
Lumber				
Plywood and OSB				
Wood Paneling				
Wood Trim				
Miscellaneous Metals				
Structural Steel				
Rough Hardware				
Insulation				
Roofing				
Doors and Frames				
Door Hardware				
Windows				
Glazing				
Acoustical Tile				
Carpet				
Carpet Pad				
Demountable Partitions				
Equipment				
Cabinets				
Plumbing Fixtures				
Piping				
Piping Supports and Hangers				
Valves				
Sprinklers				
Mechanical Equipment				
Electrical Conduit				
Copper Wiring				
Light Fixtures				
Lamps				
Lighting Ballasts				
Electrical Devices				
Switchgear and Panelboards				
Transformers				
Other:				

FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						
Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						
Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

FORM CWM-4: DEMOLITION WASTE REDUCTION WORK PLAN

MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Asphaltic Concrete Paving						
Concrete						
Brick						
CMU						
Lumber						
Plywood and OSB						
Wood Paneling						
Wood Trim						
Miscellaneous Metals						
Structural Steel						
Rough Hardware						
Insulation						
Roofing						
Doors and Frames						
Door Hardware						
Windows						
Glazing						
Acoustical Tile						
Carpet						
Carpet Pad						
Demountable Partitions						
Equipment						
Cabinets						
Plumbing Fixtures						
Piping						
Supports and Hangers						
Valves						
Sprinklers						
Mechanical Equipment						
Electrical Conduit						
Copper Wiring						
Light Fixtures						
Lamps						
Lighting Ballasts						
Electrical Devices						
Switchgear and Panelboards						
Transformers						
Other:						

FORM CWM-5: COST/REVENUE ANALYSIS OF CONSTRUCTION WASTE REDUCTION WORK PLAN

MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-6: COST/REVENUE ANALYSIS OF DEMOLITION WASTE REDUCTION WORK PLAN

MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mech. Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								
Other:								

FORM CWM-7: CONSTRUCTION WASTE REDUCTION PROGRESS REPORT

MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-8: DEMOLITION WASTE REDUCTION PROGRESS REPORT

MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mechanical Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								
Other:								

SECTION 017700 - 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, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
 - 2. Section 013233 "Photographic Documentation" for submitting Final Completion construction photographic documentation.
 - 3. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 4. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 5. Section 017900 "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: Initial submittal at Substantial Completion.
- 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. Field Report: For pest-control inspection.
- D. DSA: Upload DSA 6-C to DSA Box, provide copy of DSA 6-C to Owner

1.6 MAINTENANCE MATERIAL SUBMITTALS

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

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. 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.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 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. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
 - 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 Architect's or Owner's signature for receipt of submittals.
 - 5. Submit testing, adjusting, and balancing records.
 - 6. Submit sustainable design submittals not previously submitted.
 - 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 6. Advise Owner of changeover in utility services.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements.
 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect 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. 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. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements. Advise the Owner of pending insurance changeover requirements.
 4. Submit Final Completion photographic documentation.

- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS

- 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, listed by room or space number.
 - 2. Organize items applying to each space by major element, including categories for ceilings, 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 one of the following formats:
 - a. PDF Electronic File: Architect will return annotated file.
 - b. Three Paper Copies: Architect will return one copy.

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect 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. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - 1. Submit on digital media acceptable to Architect by email to Architect.

E. Warranties in Paper Form:

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.

F. 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 Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum 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 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. Remove snow and ice to provide safe access to building.
 - f. 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.
 - g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
 - i. Vacuum and mop concrete.
 - j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - k. 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.
 - l. Remove labels that are not permanent.
 - m. Wipe surfaces of mechanical and electrical equipment[, elevator equipment,] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
 - r. Clean strainers.
 - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 015000 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

SECTION 017823 – 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 manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for 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. Architect and Commissioning Authority will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit by uploading to web-based project software site. Enable reviewer comments on draft submittals.

2. Submit four paper copies. Architect will return two copies.
 - C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.
 - D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 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 and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.
 - E. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.
- 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: Bookmark 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, and subject matter of contents. 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. Enclose title pages and directories in clear plastic sleeves.
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 REQUIREMENTS FOR EMERGENCY, 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 Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for 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."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
 2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
 1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.

7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

1.9 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 Owner'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.

1.10 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 Owner'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.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. 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.

- J. 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 maintenance manuals.

1.11 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 017823

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SECTION 017839 - 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 017700 "Closeout Procedures" for general closeout procedures.
 - 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints and one set of file prints.
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned Record Prints and one set of file prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories 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. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories and one paper copy of each submittal.

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.
 - 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.
 - e. Cross-reference record prints to corresponding photographic documentation.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - 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 or Construction Change Directive.
 - 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.
 - 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 prints 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, and similar identification, where applicable.
- B. Record drawings shall be updated monthly and review with Inspector of Record at the time of Contractor Pay Application.

- C. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as for the original Contract Drawings.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 4. Refer instances of uncertainty to Architect for resolution.
 5. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- D. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- E. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

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. Record the name of manufacturer, supplier, installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Record drawings shall be updated monthly and review with Inspector of Record at the time of Contractor Pay Application.
- C. Format: Submit record specifications as annotated PDF electronic file.

1.6 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- 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. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file.
1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file or scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents 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 reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

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SECTION 017900 – 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 Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

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, and videographer.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

- A. Training Manuals:
 1. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

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, complying with requirements in Section 01 43 00 "Quality Requirements," 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.

1.6 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner'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 and approved 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. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner with at least 30 days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.10 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD modewith vibration reduction technology.
 - 1. Submit video recordings on CD-ROM, DVD, or 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 on 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 recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:
 - a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. Email address.
- B. 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.
- C. 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.
- D. 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 017900

SECTION 01 8113 - SUSTAINABLE DESIGN REQUIREMENTS – CALGREEN NON-RESIDENTIAL MANDATORY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: General requirements and procedures for compliance with and certification from 24 CCR 11 (hereafter, "CALGreen").
 - 1. Some CALGreen requirements depend on product selections and may not be specifically identified as CALGreen requirements. Compliance with CALGreen requirements may be used as one criterion to evaluate substitution requests and comparable product requests.
 - 2. Copies of CALGreen project checklists are attached at the end of this Section for information only. The checklists are for Mandatory Measures, with additional available for the voluntary CALGreen Tier 1 and Tier 2 levels of certification.
 - a. Some CALGreen requirements depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.

1.2 DEFINITIONS

- A. VOCs: Volatile organic compounds.
- B. Composite Wood Products: Hardwood plywood, particleboard, and medium-density fiberboard. Composite wood products do not include hardboard, structural plywood.
- C. Recycled Content: Component of a material made of recycled materials. Recycled material can be derived from two sources: pre-consumer, also known as "post-industrial," or "post-consumer." "Post-consumer recycled material" refers to items, such as aluminum cans, that have been in the consumer market. Post-industrial material is waste generated from the original manufacturing process that is used again.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Submit documentation to enforcing agency for credits that are the responsibility of Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until enforcing agency has made its determination on Project's CALGreen certification application.
 - 1. Document correspondence with review team, as assigned by the enforcing agency, as informational submittals.
- B. Environmental Management System: Document the following:
 - 1. Environmental policy.
 - 2. Regulatory compliance and training.

3. Environmental risk assessment that shows sensitive environmental areas and ranks potential risks that may arise from the construction.
4. Environmental risk management strategies.
5. Environmental management roles, responsibilities, and reporting structure for the construction phase.
6. Site and work instructions for site personnel, outlining environmental procedures during construction.
7. Environmental inspection checklists.
8. Records of compliance.

1.4 ACTION SUBMITTALS

A. General: Submit additional sustainable design submittals required by other Specification Sections.

B. Sustainable Design Documentation Submittals:

1. Stormwater pollution prevention plan.
2. Product data for irrigation system components, including, but not limited to, the following:
 - a. Sprinkler Heads: Indicate degree of head rotation and spray characteristics/pattern.
 - b. Controllers and sensors.
3. Product data and schedules for plumbing fixtures and fittings. Include rated capacities and WaterSense certification where applicable.
4. Product data for residential appliances, indicating that products are Energy Star rated.
5. Environmental management system documents.
6. Lighting controls.
7. Environmental product declarations.
8. Third-party certifications based on multiple-attribute standards.
9. Third-party certified life-cycle product assessments.
10. Product data, manufacturer's certifications, chain-of-custody certification, or other documentation acceptable to authorities having jurisdiction; for products containing composite wood, agrifiber products, or wood glues, indicate compliance with California Air Resource Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Missions from Composite Wood."
11. Construction waste management plan complying with Section 01 7419 "Construction Waste Management and Disposal."
12. Product data and laboratory test reports for adhesives and sealants indicating VOC content and compliance with requirements for low-emitting materials.
13. Certificates for carpet and under-carpet adhesives indicating compliance with Carpet and Rug Institute's Green Label Plus testing program.
14. Product data and laboratory test reports for paints and coatings indicating VOC content and compliance with requirements for low-emitting materials.
15. Laboratory test reports for hard flooring, insulation, acoustical ceilings, and wall coverings, indicating compliance with requirements for low-emitting materials, as defined in "Low-Emitting Materials" Article.

16. IAQ testing report from testing and inspecting agency indicating results of IAQ testing and documentation that show compliance with IAQ testing procedures and requirements.

1.5 INFORMATIONAL SUBMITTALS

- A. Project Materials Cost Data: Submit statement indicating total cost for materials used for the Work. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:
 1. Plumbing.
 2. Mechanical.
 3. Electrical.
 4. Specialty items, such as elevators and equipment.
 5. Wood-based construction materials.
- B. Sustainable Design Action Plans: Submit preliminary submittals within 30 days of date established for the Notice to Proceed indicating how the following requirements will be met:
 1. CALGreen checklist for mandatory measures.
 2. CALGreen Tier 1 or Tier 2 checklist as required.
 3. List of products with environmental product declarations.
 4. List of products complying with requirements for multiple-attribute standards.
 5. List of products complying with requirements for life-cycle product assessments.
 6. Environmental policy.
 7. Waste management plan complying with Section 01 7419 "Construction Waste Management and Disposal."
 8. Construction IAQ management plan.
- C. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with sustainable design action plans.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide products and procedures necessary to comply with CALGreen requirements referenced in the Evaluations. Although other Sections may specify some requirements that contribute to referenced CALGreen requirements, determine additional materials and procedures necessary to comply with CALGreen requirements indicated.

2.2 LOW-EMITTING MATERIALS

- A. Adhesives and Sealants:
 1. For field applications inside the building, adhesives and sealants shall comply with the following VOC content limits:

- a. Wood Glues: 30 g/L.
 - b. Metal-to-Metal Adhesives: 30 g/L.
 - c. Adhesives for Porous Materials (except Wood): 50 g/L.
 - d. Subfloor Adhesives: 50 g/L.
 - e. Plastic Foam Adhesives: 50 g/L.
 - f. Carpet Adhesives: 50 g/L.
 - g. Carpet Pad Adhesives: 50 g/L.
 - h. VCT and Asphalt Tile Adhesives: 50 g/L.
 - i. Cove Base Adhesives: 50 g/L.
 - j. Gypsum Board and Panel Adhesives: 50 g/L.
 - k. Rubber Floor Adhesives: 60 g/L.
 - l. Ceramic Tile Adhesives: 65 g/L.
 - m. Multipurpose Construction Adhesives: 70 g/L.
 - n. Fiberglass Adhesives: 80 g/L.
 - o. Contact Adhesive: 80 g/L.
 - p. Structural Glazing Adhesives: 100 g/L.
 - q. Wood Flooring Adhesive: 100 g/L.
 - r. Single-Ply Roof Membrane Adhesive: 250 g/L.
 - s. Special-Purpose Contact Adhesive (Contact Adhesive That Is Used to Bond Melamine Covered Board, Metal, Unsupported Vinyl, Rubber, or Wood Veneer 1/16 Inch or Less in Thickness to Any Surface): 250 g/L.
 - t. Plastic Cement Welding Compounds: 250 g/L.
 - u. ABS Welding Compounds: 325 g/L.
 - v. CPVC Welding Compounds: 490 g/L.
 - w. PVC Welding Compounds: 510 g/L.
 - x. Adhesive Primer for Plastic: 550 g/L.
 - y. Architectural Sealants: 250 g/L.
 - z. Nonmembrane Roof Sealants: 300 g/L.
 - aa. Single-Ply Roof Membrane Sealants: 450 g/L.
 - bb. Other Sealants: 420 g/L.
2. For field applications inside the building, adhesives and sealants must comply with the requirements of SCAQMD Rule 1168 or local code when tested in accordance with the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Carpet, cushion, and under-carpet adhesives will comply with CRI's Green Label Plus testing program.
- C. Paints: For field applications inside the building, wall paints must comply with local code requirements when tested in accordance with the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Resilient Flooring: Flooring must be certified by the Resilient Floor Covering Institute and/or be compliant when tested in accordance with the California Department of Public Health's "Standard

Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Flooring must also comply with the Collaborative for High Performance Schools (CHPS) requirements.

- E. Thermal Insulation: Provide insulation complying with CALGreen Tier 1 or 2 requirements.
- F. Ceiling and Wall Panels: Acoustical ceiling and wall-cladding products must comply with the VOC emissions limits defined in the CHPS criteria and be listed in the CHPS Pre-Approved Products database or have a Greenguard Certification Program.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

- A. CALGreen requires use of a construction waste management plan outlining how waste will be divided on the construction site, as well as how often it will be hauled to a landfill or recycling center and by whom.
- B. CALGreen includes a sample plan outlining all specific requirements of the plan.
- C. Comply with Section 01 7419 "Construction Waste Management and Disposal."

3.2 INDOOR-AIR-QUALITY ASSESSMENT

- A. Air-Quality Testing:
 - 1. Conduct baseline IAQ testing, after substantial completion of construction and prior to occupancy, in accordance with the EPA's "Testing for Indoor Air Quality."
 - 2. Verify compliance with standards and limits in the EPA's "Testing for Indoor Air Quality."
 - a. Carbon monoxide maximum is 9 ppm, not to exceed outdoor levels by 2 ppm.
 - b. Formaldehyde maximum is 27 ppb.
 - c. Particulates maximum is 50 micrograms per cubic meter.
 - d. 4-Phenylcycohexene maximum is 6.5 micrograms per cubic meter.
 - e. Total VOC maximum is 300 micrograms per cubic meter.
 - 3. For each sampling point where the maximum concentration limits are exceeded, take corrective action until air samples indicate compliance.
 - 4. For each sampling point where airborne mold and mildew indoor species distribution varies by more than 10 percent from exterior sampling specification, identify source of mold and mildew and remediate with corrective action, then retest until compliant results are attained.
 - 5. If noncompliant test results occur, provide a written report describing source(s) of noncompliant condition(s) and corrective action(s) implemented.

END OF SECTION 018113

SECTION 024119 - SELECTIVE DEMOLITION**PART 1 - GENERAL****1.1 SUMMARY****A. The Work of this Section Includes:**

1. Demolition and removal of selected portions of site elements.
2. Removal and salvage of existing items for delivery to Owner and removal of existing items for reinstallation.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
3. Section 017300 "Execution" for cutting and patching procedures.
4. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner as indicated.
- 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: Existing items of construction that are not to be removed.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.5 INFORMATIONAL SUBMITTALS

- A. Survey of Existing Conditions: Submit survey.
- B. 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.

1.6 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 FIELD CONDITIONS

- A. Owner will not occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

- 1. Before selective demolition, Owner will remove the following items:

- a. Freestanding furniture and equipment.
 - b. Audio-visual equipment.
 - c. Wireless Access Points

- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

- D. Hazardous Materials:

- 1. Hazardous materials are present in buildings and structures to be selectively demolished. Reports on the presence of hazardous materials is on file for review and use. Examine reports to become aware of locations where hazardous materials are present.

- a. Hazardous material remediation is specified in Section 021000 "Hazardous Materials Abatement (Asbestos and Lead Abatement)."
 - b. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified in Section 022000 "Hazardous Material Mediation."

- E. On-site sale of removed items or materials is not permitted.

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/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. 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. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and measured drawings. Comply with Section 013233 "Photographic Documentation."
 - 1. Inventory and record the condition of items to be removed for salvage or reinstallation. Photograph conditions that might be misconstrued as damage caused by removal.
 - 2. Photograph existing conditions of adjoining construction including finish surfaces, that might be misconstrued as damage caused by selective demolition operations or removal of items for salvage or reinstallation.

3.2 PREPARATION

- A. 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.
- B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- C. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment in accordance with 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND BUILDING SYSTEMS

- A. Existing Services/Systems to Remain: Maintain utilities and building systems and equipment to remain and protect against damage during selective demolition operations.
 1. Maintain fire-protection facilities in service during selective demolition operations.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utilities and building systems serving areas to be selectively demolished.
 1. Owner will arrange to shut off indicated utilities when requested by Contractor.
 2. If disconnection of utilities and building systems will affect adjacent occupied parts of the building, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to those parts of the building.
 3. Demolish and remove existing building 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. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment and components.
 4. Abandon existing building systems, equipment, and components indicated on Drawings to be abandoned in place.
 - a. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 5. Remove and reinstall/salvage existing building systems, equipment, and components indicated on drawings to be removed and reinstalled or removed and salvaged:
 - a. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment and components; when appropriate, reinstall, reconnect, and make equipment operational.

- b. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and components and deliver to Owner.

3.4 SALVAGE/REINSTALL

A. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

B. 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.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least 30 minutes after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 9. Locate selective 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 selective 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 Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways 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.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete:
1. 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. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive in accordance with recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- E. 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 073113 "Asphalt Shingles" for new roofing requirements.
1. Remove existing roof membrane, flashings, and roof accessories.
 2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and recycle or dispose of them in accordance with Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. 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 017419 "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.

END OF SECTION 024119

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SECTION 03 10 00 - CONCRETE FORMWORK**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Provide concrete formwork for all cast-in-place concrete.

1.3 RELATED SECTIONS

- A. Section 03 2000 - Reinforcing Steel.
- B. Section 03 3000 - Cast-in-Place Concrete.

1.4 REFERENCES

- A. The latest editions of specifications and standards referenced herein and published by the following organizations applies to the Work of this Section only to the extent specified by the reference.

ACI	American Concrete Institute
PS	U.S. Department of Commerce Product Standards
WCLIB	West Coast Lumber Inspection Bureau
WWPA	Western Wood Products Association

1.5 DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing to conform to requirements of 2022 CBC and the following Publications.

ACI 347 - Standard Recommended Practice for Concrete Formwork.
ACI 301 - Specifications for Structural Concrete for Buildings.
ACI 318 - Building Code Requirements for Reinforced Concrete

- B. Complete concrete elements to conform to required shape, line and dimensions. Include all possible loading conditions in the design of formwork and shoring. Ensure all applicable safety laws are strictly enforced and maintain a safe construction Project.

1.6 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.

1.7 QUALITY ASSURANCE

- A. Codes and Standards: Perform Work in compliance with applicable requirements of governing authorities having jurisdiction.

Chapter 19A of the 2022 California Building Code including all Applicable State of California Amendments (CBC).

1. Article 1.05 Design Requirements of this Section 03 1000.

- B. Construction and maintenance of all concrete formwork shall be under the continuous supervision of a foreman with not less than 3 years of successful experience in the forming and the removal of forms for architectural quality work.

1.8 DELIVERY, STORAGE AND PROTECTION

- A. Deliver and store all forms and materials above ground in a manner to protect them from damage, contamination and deterioration.

1.9 COORDINATION

- A. Coordinate the Work of other Sections and Divisions shown to be incorporated into concrete elements. Work of others shown passing through footings and concrete walls are only allowed if detailed on the Structural Drawings.

PART 2 – PRODUCTS

2.1 FORM MATERIAL

- A. Forms for Unexposed Concrete: Form concrete surfaces which will not be exposed in the

finished structure with plywood, lumber, metal or other acceptable material.

1. Lumber: Standard or better grade Douglas Fir, meeting the requirements of WCLIB "Standard Grading Rules No. 16" or WWPA "Western Lumber Grading Rules 88. Use boards which are surfaced on at least 2 edges and one side for a tight fit.
 2. Plywood: B-B Plyform, Class I, exterior grade meeting the requirements of PS 1, 5/8-inch minimum thickness for 12 inch stud spacing and 3/4-inch minimum thickness for 16 inch stud spacing.
- B. Forms for Exposed Finish Concrete: Construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practical sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.
- C. Framing, Studding and Bracing: "Standard" or "Construction" grade Douglas Fir, S4S, meeting the requirements of the WCLIB "Standard Grading Rules No. 16" or WWPA "Western Lumber Grading Rules 88."
- D. Form Coating: Non-grain raising and non-staining type that will not leave residual matter on surface of concrete or adversely affect proper bonding of subsequent application of other material applied to concrete surface. Coatings containing mineral oils or other nondrying ingredients will not be permitted. Form coating for use with form liners shall be of type recommended by form liner manufacturer.
- E. Nails: Common wire, steel.
- F. Waterstop: 3/16" thick, ribbed, PVC waterstop by Greenstreak or approved equal.

2.2 TIES AND SPREADERS

- A. Form Ties and Spreaders: Standard metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete surfaces. Inner tie rod shall be left in concrete when forms are removed. Wire ties or wood spreaders will not be permitted. Form ties shall be a type which does not leave an open hole through the concrete and which permits neat and solid patching at every hole.

PART 3 – EXECUTION

3.1 ERECTION

- A. Concrete below grade may be placed directly against earth in open trenches. Side forms for footings may be of earth provided the soil will stand without caving and the side of the banks are

made with neat cuts to minimum dimensions indicated on the Drawings.

- B. Where footing excavations exceed widths and lengths shown on the Drawings, extend formwork to bottom of excavation.
- C. Make all necessary provisions to prevent cave-ins during the placement of concrete.
- D. All forms shall be constructed true to line and level, sufficiently tight to prevent leakage of mortar, and shall conform per ACI Standards, to the dimensions of the finished concrete as shown on the Drawings. Finished concrete surfaces shall show no visible signs of bow or deflection.
- E. Wooden supports or spreaders for forms shall not extend into concrete pours.
- F. Set and secure all required steel assemblies, angles, pipe sleeves, bolts, inserts, and other such items required to be anchored in the concrete before the concrete is placed.
- G. Construct all forms straight, true, plumb, and square within a tolerance horizontally of one in 200 and a tolerance vertically of one in 500.
- H. Keep forms sufficiently wetted to prevent joints opening up before concrete is placed.
- I. Bracing:
 - 1. Properly brace and tie the forms together so as to maintain position and shape and to ensure safety of personnel.
 - 2. Construct all bracing, supporting members and centering of ample size and strength to safely carry, without excessive deflections, all dead and live loads to which they may be subjected.
 - 3. Properly space the forms apart and securely tie them together using metal spreader ties that give positive tying and accurate spreading.

3.2 REMOVAL OF FORMS

- A. Do not disturb or remove forms until the concrete has developed sufficient strength to safely sustain its own weight and superimposed loads above. After concrete is placed, a minimum time period of ten days shall elapse before the removal of forms can be considered.
 - 1. Forms for at grade concrete may be removed in 24 hours providing removal does not damage surfaces and edges of concrete.
- B. Use all means necessary to protect workers, passers by, the installed Work of other trades, and the complete safety of the structure.

- C. Cut nail and tie wires or form ties off flush, and level all surfaces smooth and clean.
- D. Remove metal spreader ties on exposed concrete by removing or snapping off inside the wall surfaces and patching up the resulting pockets to match the surrounding areas.
- E. Flush all holes resulting from the use of spreaders, rods and sleeve nuts, using water, and then solidly pack throughout the wall thickness with cement grout applied under pressure by means of a grouting gun; grout shall be one part Portland cement to 2.5 parts sand; apply grout immediately after removing forms.

Section continued on next page

3.3 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of this Specification Section, unless a substitution product is being proposed, in which case refer to Division 1 Section "Substitutions" for Substitution requests.

Contractor's	Contractor is to acknowledge with initials each submittal included.
Initials	Attach a letter of explanation for each submittal not included

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE:

_____ 1. Qualifications (relevant experience) of foreman.

END OF SECTION 03 1000

SECTION 03 20 00 - REINFORCING STEEL**PART 1 – GENERAL****1.1 RELATED DOCUMENT**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Furnish, fabricate and install all reinforcing steel for cast-in-place concrete as necessary to complete all reinforced concrete work.
- B. Furnish and fabricate reinforcing steel only for masonry construction.

1.3 RELATED SECTIONS

- A. Section 03 1000 - Concrete Formwork
- B. Section 03 3000 - Cast-in-Place Concrete

1.4 REFERENCES

- A. The latest editions of specifications and standards referenced herein and published by the following organizations apply to the Work only to the extent specified by the reference.

ASTM	American Society for Testing and Materials
ACI	American Concrete Institute
AWS	American Welding Society
CRSI	Concrete Reinforcing Steel Institute
CBC STDS	2022 California Building Code Standards

1.5 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specifications

Sections.

- B. Refer to "Submittal Requirements and Schedules" Article at the end of this Section for required submittals.

1.6 QUALITY ASSURANCE

- A. Codes and Standards: Perform Work in accordance with applicable requirements of governing authorities having jurisdiction.
 - 1. Chapters 19A and 21A of the 2022 California Building Code.
- B. Provide mill Reports for all types and sizes of reinforcing steel for review and acceptance prior to fabrication and transporting reinforcing steel to the construction site.
 - 1. Mill reports shall contain the steel source, description, heat number, yield point, ultimate tensile strength, elongation percentage, bend test and chemical analysis.
 - a. If the reports show that material is satisfactory no tests will be required.
 - b. For foreign steel, testing as specified below will be required by a testing laboratory acceptable to the Architect and DSA.
 - c. Certification from any other sources will not be acceptable.
 - 2. Ensure that the material delivered for use is that represented by the mill reports and obtain copies of mill reports, examine them, certify whether the material represented complies with Specifications requirements, and make distribution of reports as required. Report chemical composition of each heat, as determined by ladle analysis.
 - 3. Where materials proposed for use cannot be identified, the Owner shall pay for an approved testing laboratory to make one series of tests (tensile and bend) from each 2.5 tons, or fraction thereof, of each size and kind of reinforcing steel. Include 2 samples, minimum, of sufficient length to allow tests to be made on the as-rolled bar. The Owner shall then back-charge the Contractor for all testing fees.
- C. Contact Architect for observation of all concrete reinforcing.
- D. Testing and Inspections shall comply with Section 014100 and as noted in the Contract Documents.

1.7 DELIVERY, STORAGE AND PROTECTION

- A. Bundle reinforcing steel and tag with suitable identification to facilitate sorting and placing in accordance to the placement drawings.
- B. Store above ground, in a manner to prevent excessive rusting and fouling with dirt, grease, and

other bond breaking coatings.

1.8 COORDINATION

- A. Coordinate the Work of other Sections and Divisions shown to be incorporated into concrete elements. Work of others shown passing through footings and concrete walls are only allowed if detailed on the Structural Drawings.
- B. Coordinate placement locations of all masonry dowels with Section 04 2000 whenever they are required to be embedded in cast-in-concrete.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. All materials shall be new, free from rust and mill scale. Reinforcing bars shall comply with ASTM A 615:

Grade 60 for all bars .
- B. Reinforcing bars shown welded on the Drawings and welded in the field shall be new material, free from rust and mill scale, conforming to ASTM A 706, Grade 60 for all sizes.
- C. Tie Wire: 16 gage, annealed conforming to ASTM A 82.
- D. Welding Electrodes: AWS A5.1 or Grade E70XX for welding Grade 60, ASTM A 706 bars.

2.2 SUPPORTS FOR REINFORCING BARS

- A. Provide supports for reinforcement including bolsters, chairs, spacers, concrete block and other devices for spacing, supporting and fastening reinforcing bars in place.

PART 3 – EXECUTION

3.1 FABRICATION

- A. General
 - 1. Bend all bars cold. Comply with ACI 318-19 Section 26.6.3.
 - 2. Do not use bars with kinks or bend not shown on the Drawings.

3. Make bends for stirrups and ties in accordance with details on the Drawings.

B. Fabricate and place reinforcing steel in accordance with CRSI Manual of Practice, ACI" SP-66 and ACI 318-19.

C. Welding of ASTM A 706 reinforcing shall conform to ACI 318-19 Section 26.6.4.

3.2 PLACING

A. General: Before commencing with concrete placement, accurately place all concrete reinforcing steel including dowels for masonry. Secure in place and provide positive support using concrete block, metal chairs or spacers, or by metal hangers. Set tie-wire ends directed into concrete, away from formed exposed concrete surfaces. Comply with ACI 318-19 Section 26.6.2.

1. Reinforcing steel shall be placed in accordance with the Drawings and the latest edition of the CRSI "Manual of Standard Practice".

B. Clearance:

1. Preserve clear space between bars of not less than one times the nominal diameter of reinforcing, but not less than 1.33 times the maximum size of coarse aggregate, nor less than 1 inch.
2. Provide minimum concrete coverage for reinforcing as noted in the General Notes shown on Drawings. Minimum concrete coverage dimensions also applies to tie wires.

C. Splicing:

1. Horizontal and vertical bars:
 - a. Place bars with minimum lap at splices to develop the strength of the bar.
 - b. Bars may be wired together at laps.
 - c. Whenever possible, stagger the splices of adjacent bars.
 - d. Splice bars a minimum as shown on the Drawings.
 - e. Clear spacing to be the same as Section 3.2B(1) above.

3.3 CLEANING REINFORCEMENT

A. Steel reinforcement, at the time concrete is placed, shall be free from rust, loose mill scale, oil, paint, and all other coatings which will destroy or reduce bond between steel and concrete, and between steel and grout. Comply with ACI 318-19, Section 26.6.1.2.

3.4 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of this Specification Section, unless a substitution product is being proposed, in which case refer to Division 1 Section "Substitutions" for Substitution requests.

Contractor's Contractor is to acknowledge with initials each submittal included. Attach a letter of explanation for each submittal not included.

Initials

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE:

- _____ 1. Mill certificates for each size and grade of steel intended for use in the Project, stating physical and chemical properties and compliance with ASTM requirements.
- _____ 2. Placement sheets and related details. Indicate sizes, fabricated shapes, dimensions, spacing, material, grade and locations within concrete and masonry Work.
- _____ 3. Epoxy adhesive.

END OF SECTION 03 2000

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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 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Provide finish, cure, repair, protect and clean (where exposed) all cast-in-place concrete required for foundations, starter walls, slabs-on-grade, and other concrete indicated.
- B. Provide moisture barriers, granular subbase and sand cover for moisture barrier located below concrete slabs cast-on-grade.

1.3 RELATED SECTIONS

- A. Section 03 1000 - Concrete Formwork
- B. Section 03 2000 - Reinforcing Steel

1.4 REFERENCES

- A. The latest editions of specifications and standards referenced herein and published by the following organizations apply to the Work of this Section only to the extent specified by the reference.

ACI	American Concrete Institute
ASTM	American Society for Testing and Materials
CBC STDS	2022 California Building Code Standards

033000 CAST-IN-PLACE CONCRETE

1.5 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.
- B. Refer to "Submittal Requirements and Schedules" Article at the end of this Section for required submittals.

1.6 QUALITY ASSURANCE

- A. Codes and Standards: Perform Work in compliance with applicable requirements of governing authorities having jurisdiction.
 - 1. Chapter 19A of the 2022 California Building Code including all applicable State of California Amendments (CBC).
 - 2. ACI 301 - Specifications for Structural Concrete for Buildings.
 - 3. ACI 318 - Building Code Requirements for Reinforced Concrete.
 - 4. ACI Publication SP-15 - Specifications for Structural Concrete for Buildings with selected ACI and ASTM references. All apply to the Work of this Section where applicable.
- B. Specified aggregates, cement, and color from single sources only.
- C. Approved concrete mix designs shall not be altered without approval of the Architect.
- D. Testing and Inspection: Shall comply with Special Inspection form D-103, Special Inspections stated in structural drawings, and with the 2022 CBC except as modified below.
 - 1. Contractor shall coordinate and provide access to all locations for specimen sampling and inspection.
 - 2. Contractor shall notify Project Inspector at least 48 hours prior to commencing preparation for placement of concrete. Coordinate and provide access to all locations for testing and inspection of Concrete Work.
- E. Contractor and tradesmen constructing forms, placing and curing Architectural concrete for walls, columns and piers shall have at least five years of successful experience in this work. Provide experience records and references to Architect immediately upon receiving notice to proceed.
- F. Concrete must have a Floor Flatness, Ff, of at least 50 with a minimum of 35. Concrete must have a Floor Levelness, Fl, of at least 40.

1.7 DELIVERY, STORAGE AND PROTECTION

033000 CAST-IN-PLACE CONCRETE

- A. Deliver and store all materials in a manner to protect them from damage, contamination and deterioration.

1.8 COORDINATION

- A. Coordinate with Divisions 12, 14, 22, 26 and other Divisions requiring items of their Work to be embedded into cast-in-place concrete.
- B. Notify Architect and Project Inspector a minimum of 24 hours prior to each commencement of concrete placement and before forms are closed-in.

PART 2 – PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: ASTM C 150, Type II
- B. Course and Fine Aggregates: ASTM C 33
- C. Water: Clean and not be detrimental to concrete

2.2 ADMIXTURES

- A. Chemical: Water Reducing per ASTM C 494, Type A
- B. Fly Ash: ASTM C 618, Type F

2.3 ACCESSORIES

- A. Bonding Agent: Polymer resin emulsion
- B. Vapor Barrier: Class A conforming to ASTM Standard E 1745-11.
- C. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing a minimum compressive strength of 5,000 psi within 28 days.

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- D. Concrete Adhesive: "SET-XP" Adhesive by Simpson Strong-Tie Company, Hilti (Hilti "HIT-RE 500-V3"), or approved equal.
- E. Curing compound:
 - 1. Liquid membrane-forming compound complying with ASTM C 309, Type 1 (1D), Class B, guaranteed not to affect the appearance of the concrete surfaces, and the bond, adhesion, or effectiveness of finishes and surface treatment specified herein to be applied to concrete.
 - 2. Curing compound used on exposed concrete surfaces shall be non-discoloring, fast drying and shall be conclusively demonstrated not to darken or yellow with age.
 - 3. Curing compound for use on concrete floors to receive adhered covering shall be specially formulated for such use and shall be certified by the manufacturer not to inhibit the bonding qualities of flooring adhesives.

2.4 JOINT DEVICES AND FILLER MATERIALS

- A. Closed cell polyvinyl chloride form, resilient, recovery of 95 percent if not compressed more than 50 percent of original thickness.
- B. Construction Joint Devices: Non-metallic tongue and groove profile.
- C. Sealants and primers: As specified in Section 07 9000.

2.5 CONCRETE MIX

- A. Submit concrete mix design(s) prepared by a testing laboratory, designed by a registered civil or structural engineer, and approved by Architect review and acceptance, prior to delivery of concrete to site.
 - 1. Provide cast-in-concrete to meet the following:
 - a. Normal (Stone) weight concrete in accordance with ACI 301, except as noted below
 - b. Minimum 28-day compressive strength:
 - 1. Slab-on-grade & footings: 3,000 psi
 - c. Maximum water-cement ratio:
 - 1. Slab-on-grade & footings: 0.45
 - 2. Footings: 0.45
 - 3. Retaining walls: 0.45
 - 4. Caisson: 0.45
 - d. Slump: 4" (plus or minus 1 inch) unless noted otherwise.
 - e. Fly Ash - (up to a maximum of 18% of cement content by volume).

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- f. Coarse aggregate to be Santa Margarita Granite Aggregate, San Gabriel Aggregate, Heavy-Media Processed; or other clean coarse aggregate of lower or equal reactivity.
 - g. Fine aggregate from Santa Margarita Granite Aggregate, Moorpark Source, or other clean fine aggregate of lower or equal reactivity.
 - h. Calcium chloride not allowed.
- B. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C 94 and furnish batch ticket information.

2.6 SUBBASE BELOW CONCRETE SIDEWALKS AND SLABS-ON-GRADE:

- A. Clean, free draining Santa Margarita Granite sand, Moorpark Source, or those pre-approved non-reactive fine aggregate.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify requirements for minimum concrete cover over reinforcement.
- B. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
- B. In locations where new concrete is doweled to existing Work, drill holes in existing concrete, insert steel dowels and fill solid with concrete adhesive.
- C. Coordinate the placement of joist devices with erection of concrete formwork and placement of form accessories.

3.3 PLACING CONCRETE

033000 CAST-IN-PLACE CONCRETE

- A. Place concrete in accordance with ACI 318-19 Section 26.5.2, and ACI Publication SP 15.
- B. Place concrete continuously between predetermined expansion, control, and construction joints.
- C. Do not interrupt successive placement; do not permit cold joints to occur.
- D. Place slabs in checkerboard pattern as indicated.
- E. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.
- F. Maintain legible copies of all transit mixed trip tickets signed by a certified weight master and records of concrete placement. Record date, location, quantity, air temperature, and test samples taken for each load delivered to site.

3.4 CONCRETE FINISHING

- A. Provide smooth rubbed finish for exposed interior concrete walls.
- B. Finish concrete floor surfaces in accordance with ACI 301.
 - 1. Steel trowel surfaces for all interior slabs unless noted otherwise.

3.5 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Cure floor surfaces with two (2) coats of spray applied curing compound in accordance with ACI 308.
- D. Curing of concrete shall comply with ACI 318–19 Section 26.5.3.

3.6 PATCHING

033000 CAST-IN-PLACE CONCRETE

- A. Notify Architect and Project Inspector to review concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect upon discovery.
- C. Patch imperfections as directed.

3.7 DEFECTIVE CONCRETE

- A. Defective Concrete Definition: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Architect.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon approval of Architect for each individual area.

3.8 TESTS & INSPECTIONS

- A. Tests and inspections shall comply with Section 01 4100 of these specifications.

Section continued on next page

033000 CAST-IN-PLACE CONCRETE

3.8 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of this Specification Section, unless a substitution product is being proposed, in which case refer to Division 1 Section "Substitutions" for Substitution requests.

Contractor's Contractor is to acknowledge with initials each submittal included. Attach a letter of explanation for each submittal not included.

Initials

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE:

- _____ 1. Product Data:
- a. Concrete Aggregates
 - b. Cement
 - c. Admixtures
 - d. Integral Colors
 - e. Curing materials
 - f. Attachment devices

- _____ 2. Concrete mix designs.

END OF SECTION 03 3000

SECTION 033543 - POLISHED CONCRETE FINISHING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Liquid floor treatments.
 - 2. Polished concrete surface finish requirements.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for new concrete designed for polished concrete finishing, including concrete materials, mixture design, placement procedures, initial finishing, and curing.

1.2 DEFINITIONS

- A. Aggregate Exposure Class: Visual observation of polished floor aggregate surface exposure area after grinding and polishing operations. Aggregate exposure class ranges are A, B, and C.
- B. Design Reference Sample: Sample designated by Owner based on prior project on San Luis Obispo High School Campus that reflects acceptable surface quality and appearance of polished concrete.
- C. Distinctness of Image (DOI): The distinctness (clarity) of images reflected by the glossy coating surface appearance of the polished concrete finish appearance levels. The transmission of this reflection is measured in accordance with ASTM D5767.
- D. Haze: The cloudiness or milky appearance of images from objects produced by reflection in a polished concrete surface. The measurement of this appearance is defined in accordance with ASTM D4039. The test method reading is put into a calculation resulting in a Haze Index value.
- E. Specular Gloss: A reflectance value determined by a single measurement of gloss from shining a known amount of light at a surface within a specific angle of illumination in accordance with ASTM D523.
- F. Floor Flatness and Floor Levelness: A quantitative method of measuring floor surface profiles to obtain estimates of the floor's characteristic FF and FL per ASTM E 1155.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 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 polished 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. Cast-in-place concrete subcontractor.
 - e. Polished concrete finishing subcontractor.
 - f. Architect.
 - g. Owner's representative.
2. Review concrete slab design for compressive strength, flatness and levelness, cold- and hot-weather concreting procedures, curing procedures, sequencing, construction joints, concrete repair procedures, concrete finishing, polished concrete appearance and aggregate exposure requirements, polished concrete mockups, and protection of polished concrete.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of all joints, including construction joints.
- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of product requiring color selection.
- D. Samples for Verification: Actual sample of finished products for each type of exposed color.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. An installer experienced in performing polished concrete finishing with a minimum of five previous projects similar in material, design, and extent to that indicated for this Project.
 - 2. Trained and certified by manufacturer of polished concrete system materials.
 - 3. Concrete Polishing Craftsman of the Concrete Polishing Council.
- B. Polished Concrete Standards: Comply with ACI 310.1.

1.6 SYSTEM DESCRIPTION

- A. Installation of polished concrete floor system for interior concrete floors by dry grinding and polishing with various size grit metal-bonded and resin-bonded diamonds and application of concrete densifier
- B. Performance Requirements: Improve performance of floor by installation of polished concrete floor system as measured by the following criteria:
 - 1. Static Coefficient of Friction, ASTM C 1028
 - a. Dry Surface: .50
 - b. Wet Surface: .50
 - 2. Specular Gloss/Reflectance, ASTM D 523
 - a. 20 Degrees: 17

- b. 60 Degrees: 35
- 3. Floor Surface Profile, ASTM E 1155
 - a. Floor Flatness Number (F_F): 25
 - b. Floor Levelness Number (F_L): 15

1.7 MOCKUPS

- A. Build one mockups 10 feet by 10 feet to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups outside of the building footprint but near the location of the Work and of the size indicated or, if not indicated, as directed by Architect for newly placed concrete.
 - 2. Demonstrate surface preparation, coloring, filled joints, pattern, curing, tested aggregate exposure, tested polish appearance, sealing and protecting of polished concrete.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 4. Remove rejected mockups.

1.8 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as needed for other construction activities.
- B. Ambient Conditions: Ensure installation location and Project ambient conditions comply with manufacturers written instructions.

PART 2 - PRODUCTS

2.1 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear liquid materials for the applications of cleaning solutions, densifiers, and sealers that strengthen or protect polished concrete surfaces.
 - 1. Densifier: Prosoco Consolideck LS/CS
 - a. Odorless
 - b. VOC: 0
 - 2. Sealer: Prosoco Polish Guard
 - a. Odorless
 - b. VOC: 0

2.2 POLISHED CONCRETE SURFACE FINISH REQUIREMENTS

- A. Aggregate Exposure Class: **Class B Fine Aggregate 85 to 95 percent fine aggregate; 5 to 15 percent blend of fines and coarse aggregate.**

- B. Polish Concrete Appearance Levels: **Level 2: Satin (Honed) up to 200- to 400-grit polish; DOI 10 to 39; Haze Reading less than 10; Reflective Sheen: Low to medium**

2.3 ACCESSORIES

- A. Repair Materials: As recommended in writing by manufacturer to repair and fill cracks, and repair surfaces compatible with polishing materials.
- B. Joint Filler: HTS Hi-Tech PE 85 polyurea, color: TBD
- C. Water: Potable.
- D. Cleaning Agents: As recommended in writing by manufacturer.

2.4 POLISHING EQUIPMENT

- A. Equipment and Supplies: Provide equipment and supplies, not limited to, the concrete grinding and concrete polisher equipment, tooling and polishing diamonds for the polished concrete finishing Work.
 - 1. Floor Grinder: Concrete Polishing Solutions (or equivalent) model as determined by installer to perform required grinding and polishing of concrete floor.
 - 2. Vacuum System: Concrete Polishing Solutions (or equivalent) model as determined by installer to perform required dust extraction during grinding and polishing of concrete floor.
 - 3. Diamond Tooling for Initial Grinding and Preparing Floor for Polishing:
 - a. Concrete Polishing Solutions "XTR" 40-grit metal-bonded diamonds. (or equivalent)
 - b. Concrete Polishing Solutions "T2 Metal/Resin Hybrid" 60/80-grit (or equivalent)
 - 4. Diamond Tooling for Polishing Concrete:
 - a. Concrete Polishing Solutions "RezElite" 100-grit resin-bonded diamonds. (or equivalent)
 - b. Concrete Polishing Solutions "RezElite" 200-grit resin-bonded diamonds. (or equivalent)
 - c. Concrete Polishing Solutions "RezElite" 400-grit resin-bonded diamonds. (or equivalent)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that concrete substrates are acceptable for grinding, polishing and product installation as recommended by manufacturer.
- B. Do not begin Work until unsatisfactory conditions have been addressed and corrected.

PREPARATION

- C. Verify that concrete substrate preparation is in accordance with manufacturer's written instructions.
- D. Clean surfaces free of dust, dirt and other contaminants incompatible with liquids applied products and polishing.
- E. Clean and seal cracks as recommended by manufacturer.

- F. Prepare, clean and fill joints with joint filler as recommended in writing by manufacturer.
- G. Clean surface completely of any dust with cleaning solution as recommended in writing by manufacturer.
- H. Floor Surface Profile:
 - a. Floor Flatness Number (F_F): 50 (Minimum Local Value: 45)
 - b. Floor Levelness Number (F_L): 35 (Minimum Local Value: 25)

3.2 APPLICATION

- A. Machine grind floor surfaces progressively to receive aggregate and polish appearance levels indicated to match approved mockup.
- B. Apply penetrating stain densifier treatment for polished concrete in polishing sequence and in accordance with manufacturer's written instructions, allowing recommended drying time between successive coats.
- C. Apply sealers to polished concrete in polishing sequence and in accordance with manufacturers' written instructions.
- D. Continue progressively polishing to aggregate and polish appearance levels to match approved mockup for final finish appearance.
- E. Visually inspect to remove defects and repolish areas that are defective. Repolish those areas that do not meet specified aggregate and polish levels per approved mockup.
- F. Complete edges of floor finish that adjoins surrounding floor areas in a sharp and clean manner.
- G. Neutralize and clean polished floor surfaces.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests at three random locations for areas up to 100 sq. ft. and inspections and to submit reports.
- B. Measure polish specular gloss level, DOI, and haze as specified; repolish if required to achieve Project requirements.
- C. Verify aggregate exposure as specified. Machine surfaces if required to achieve Project requirements.
- D. Verify compliance of slip resistance to comply with specified slip-resistance rating.
- E. Prepare test and inspection reports.

3.4 CLEANING AND PROTECTION

- A. Control and dispose of waste products produced by grinding and polishing operations.

- B. Protect installed polished concrete surfaces from damage during construction in accordance with manufacturer's written instructions. Replace floor protection materials that are damaged during construction. Remove floor protection materials at Substantial Completion

END OF SECTION 033543

SECTION 034500 - PRECAST ARCHITECTURAL CONCRETE**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Precast architectural concrete window sills.
- B. Precast architectural pilaster base.
- C. Anchors, attachments, and epoxy.
- D. Sealant
- E. Non-shrink grout

1.02 RELATED SECTIONS

- A. Section 079200 - Joint Sealants.
- B. Section 054000 – Cold Formed Metal Framing.
- C. Section 092400 - Portland Cement Plaster.

1.03 SUBMITTALS

- A. Required submittals are indicated at the end of this section.

1.04 QUALIFICATIONS

- A. Installer: Company specializing in pre-cast work with minimum ten years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 016000.
- B. Protect units to prevent staining, chipping or spalling of concrete.
- C. Mark units with date of production in location not visible to view when in final position in structure.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Moonlight Molds Inc., Gardena, CA 90248. Telephone: (310) 538 – 9142.
- B. Dura Art Stone - Fontana, CA; (714) 350 - 9000.
- C. Substitutions: Under provisions of Section 012500.

2.02 MATERIALS

- A. Cement shall be Portland cement conforming to ASTM C-150, Type 1.
 - 1. Aggregate shall conform to ASTM C-331.
 - 2. Anchor rod- Hilti-R(30455) 3/8" diam, cut to size.
 - 3. Quality: Minimum strength of 4,000 PSI at age 28 days, as determined by tests of 6-inch and 12-inch cylinders. Absorption shall be minimum of 11 percent, not to exceed 14 percent.
 - 4. Surface Texture: Surface texture shall be natural in appearance, and smooth. Surface texture to be selected by Architect.
 - 5. Color Selection: Davis Color Palomino - 5447
- B. Mortar: Portland cement, sand, latex acrylic additive and water.
- C. Joints – Silicone/sand to match color of units.
- D. Epoxy anchor rod – Hilti RE 5005D.
- E. Non-shrink Non-metalic grout – factory package, non staining, non-gaseous grout complying with HSTMC 1107, HS recommended by manufacturer for exterior use.

2.03 FABRICATION

- A. Maintain plant records and quality control program during production of precast units. Make records available upon request. All precast units to have color consistency.
- B. Use rigid molds, constructed to maintain individual precast unit uniform in shape, size and finish.

- C. Maintain consistent quality during manufacture.
- D. Drill hole for anchor rod, set rod with epoxy.
- E. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, beehiving, staining or surface cracking.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install units without damage to shape or finish.
- B. Install in accordance with California Building Code (CBC). 2022 Edition
- C. Install all joint sealants.

3.02 INSTALLATION TOLERANCES

- A. Maximum variation from plane of location: 1/8 inch in 10 feet.

Section continued on next page.

REQUIRED SUBMITTALS

Include this form with submittals of this Specification Section, unless a substitute product is being proposed, in which case refer to SECTION 012500 for SUBSTITUTION PROCEDURES.

General

Contractor's General Contractor is to acknowledge with initials each submittal included.

Initials Attach a letter of explanation for each submittal not included.

_____ All submitted products are as specified.

SUBMITTALS

_____ A. Submit under provisions of Section 013300.

_____ B. Shop drawings: Indicate layout, unit locations, joints, sealants, configurations, unit identification marks, connection details, dimensions, openings, and relationship to adjacent materials.

_____ C. Submit full range of sample.

_____ D. Submit full range of texture finish.

_____ E. Samples: Submit two precast concrete unit samples, illustrating one pattern, surface finish, color and texture.

_____ F. Submit manufacturer's qualifications and installer's qualifications.

_____ G. Submit product data on products.

SECTION CONTINUES ON FOLLOWING PAGE

WARRANTY FORM

Date: _____ Project Name: San Luis Obispo High School New Classroom BuildingGUARANTEE FOR _____, in Agreement between: San Luis Coastal Unified School District
(Specification Section) (Owner)and _____
(the "Contractor") (Name of Installer or Subcontractor or Manufacturer)

hereby guarantees to the Owner that the portion of the Work described as follows: _____

_____, which it has provided for the above referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification Section _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within twenty-four (24) months after the date hereof the undersigned receives notice from the Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within ten (10) calendar days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within ten (10) calendar days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize the Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and the Contractor will pay to the Owner promptly upon demand all costs and expenses incurred by the Owner in connection therewith.

This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

SUBCONTRACTOR OR INSTALLER

Signed _____ Title _____

Typed Name _____

Name of Firm _____

Contractor License Number _____

Address _____

Phone Number _____

MANUFACTURER (If Applicable)

Signed _____ Title _____

Typed Name _____

Name of Firm _____

CONTRACTOR

Signed _____ Title _____

Typed Name _____

Name of Firm _____

END OF SECTION 034500

SECTION 05 12 00 - STRUCTURAL STEEL**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Provide labor, equipment, supervision and structural steel as shown on the Drawings, specified herein and as needed for a complete and proper installation.

1.3 RELATED SECTIONS

- A. Section 032000 - Reinforcing Steel
- B. Section 033000 - Cast-in-Place Concrete
- C. Section 053100 - Metal Deck
- D. Section 099100 – Painting

1.4 REFERENCES

- A. The latest editions of specifications and standards referenced herein, published by the following organizations, apply to the Work of this Section only to the extent specified by the reference.

AISC American Institute of Steel Construction.
ASTM American Society for Testing and Materials.
AWS American Welding Society.
SSPC Steel Structures Painting Council.

1.5 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.

- B. Refer to "Submittal Requirements and Schedules" Article at the end of this Section for required submittals.

1.6 QUALITY ASSURANCE

- A. Fabricate structural steel members and assemblies in accordance with AISC Code of Standard Practice and Specifications. Company performing the Work of this Section shall have a least five years of satisfactory experience in fabricating structural steel.
- B. Qualification of Welders: Qualify welding procedures and welding operators in accordance with AWS D1.1, including the installation of welded studs & metal deck. Provide certifications that welders to be employed have satisfactorily passed AWS qualification tests within the past 12 months. If recertification of welders is required, retesting will be the Contractor's responsibility.
- C. Codes and Standards: Perform Work in compliance with applicable requirements of governing authorities having jurisdiction.
 - 1. Chapter 22A of the 2022 California Building Code including all applicable State of California Amendments (CBC).
- D. Erector: Company specializing in the Work for this Section shall have at least 5 years of satisfactory experience in the erection of structural steel.
- E. Testing and Inspections: Comply with Chapter 22A of the 2022 CBC, Section 01 4100 Testing and Inspection and as noted on the Structural Drawings.
 - 1. Contractor shall notify Owner's Testing and Inspection Service at least 48 hours prior to shop welding and prior to field welding of structural steel. Coordinate and provide access to all locations for testing and inspection of structural steel Work.

1.7 DELIVERY, STORAGE AND PROTECTION

- A. Delivery and Storage:
 - 1. Deliver members and materials to the job site properly marked to identify the location for which they are intended and in time to insure uninterrupted progress of the construction.
 - 2. Use markings corresponding to markings shown on the approved Shop Drawings.
 - 3. Store materials in a manner to preclude damage and permit ready access for inspection and identification of each shipment. Store steel materials, either plain or fabricated, above the ground upon platforms, pallets, skids, or other supports.
 - 4. Keep materials free from dirt, grease, and other foreign matter, and protect from corrosion. Material showing evidence of damage will be rejected and shall be immediately removed from the site.

1.8 COORDINATION

- A. Coordinate locations of items to be embedded in and/or attached to the Work of Sections 03 1000, 03 3000 and 05 3100.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Use only new and undamaged materials. Steel which in the opinion of the Architect is corroded or physically damaged shall not be incorporated in the construction.
- B. Exposed Steel Work: Where steel surfaces are exposed to view in the finish construction, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding or by welding and grinding; before cleaning, treating and application of surface finishes.

2.2 MATERIALS

- A. Structural steel wide flange shapes: ASTM A 992, Grade 50.
- B. Angles, channels, plates, rods and bars: ASTM A36
- C. Structural steel tubes: ASTM A 500, Grade B.
- D. Structural steel pipe: ASTM A 53, Type E or S, Grade B.
- E. Common Bolts and Nuts: ASTM A 325N. Provide hexagonal heads and nuts where exposed and where embedded in masonry.
- F. Anchor bolts and Rods: ASTM F 1554
- G. Automatic End Welded Studs: Studs shall be Nelson Granular Flux filled Shear Connectors or Anchor Studs, or an approved equal. Studs shall be manufactured of C-1015 cold rolled steel conforming to ASTM Specification A-108. When welding through deck, the stud diameter shall not be greater than 2.5 times the beam flange thickness. Comply with AWS D1.1.
- H. Filler metal for welding: Meet the requirements of AWS D1.1. Electrodes shall be as recommended by their manufacturer for position and other conditions of actual use.

Electrodes shall be E70 series.

- I. Moment frame welding: Meet the requirements of AWS D1.8.
- J. Primer: Manufacturer's or fabricator's standard, fast curing, lead free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated and for capability to provide a sound foundation for field applied topcoats despite prolonged exposure, complying with performance requirements of Federal Specifications TT-P-645.
- K. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additive, capable of developing a minimum compressive strength of 5,000 psi in 7 days.
- L. Galvanize structural steel assemblies, members and connectors not permanently protected from weather and moisture per ASTM A 123.
- M. Templates: Any commercial grade steel, not less than 10 gage.
- N. Galvanizing Repair Compound: High zinc dust content galvanizing repair paint conforming to Mil. Spec DOD-P-21035A, hot applied zinc rich material or equal.
- O. Reinforcing steel shall conform to Section 03 2000.

2.3 FABRICATION

- A. Fabricate and assemble materials in the shop to the greatest extent possible. Shearing, flame cutting, and chipping shall be done carefully and accurately. Coordinate connection details where steel is connected to concrete and masonry. Verify lines, levels, and dimensions, where possible, just before commencing fabrication of connection details. Correct construction that does not fit. Schedule and coordinate construction under this Section with that specified elsewhere. When not otherwise indicated or specified, comply with application requirements of AISC "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings".
- B. Before beginning fabrication or Work, wire-brush materials clean of loose mill scale and rust, and straighten by methods that will not injure the steel and so that they will comply with AISC tolerances.
- C. Welded Connections: Make welded connections in accordance with AWS D1.1. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp. Grind and dress smooth all welds exposed to view in the finish construction, so that the shape and profile of the item welded is preserved.

- D. Automatic End-Welded Studs: The studs shall be automatically end welded in accordance with AWS D1.1 in such a manner as to provide complete fusion between the end of the stud and the plate. There shall be no porosity or evidence of lack of fusion between the welded end of the stud and the plate. The stud shall decrease in length during welding approximately 1/8" for 5/8" diameter studs and under, and 3/16" for stud diameters greater than 5/8" diameter. Welding shall be done only by qualified welders approved by the welding inspector.
- E. Holes: Cut, drill, or punch holes at right angles to the surface of the metal. Do not cut or enlarge holes by burning. Holes may be enlarged by careful reaming. Holes in base or bearing plates shall be drilled. Holes shall be provided in members to permit connection the construction of other trades.
 - 1. Material may be punched 1/16 inch larger than the nominal diameter of the bolt, whenever the thickness of metal is equal to or less than the diameter of the bolt plus 1/8 inch.
- F. Templates: Fabricate individual templates for each and every assembly to be anchored to or embedded in concrete and/or masonry. Locate working centerlines of each template by drilling hole or deep center punch. Remove templates prior to erection of members.

2.4 SHOP PAINTING

- A. General: Shop paint structural steel except galvanized members or those members or portions of members to be embedded in concrete or in masonry & grout. On embedded steel which is partially exposed, paint the exposed portion and the initial 2 inches of embedded areas only. Do not paint surfaces to be welded.
- B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale and splatter, slag or flux deposits using power tool cleaning in accordance with SSPC SP-3.
- C. Painting: Immediately after surface preparation, apply shop primer in accordance with manufacturer's instructions and at a rate to provide a dry film thickness of not less than 1.5 mils. Use painting methods which results in full coverage of joints, corners, edges and exposed surfaces, without drips, sags, etc.

2.5 GALVANIZING

- A. General: All steel and ferrous metal items located on the exterior of the buildings, exposed to moisture and otherwise indicated to be galvanized shall be galvanized by the hot-dip process, meeting the requirements of ASTM A 123. All required hot-dip galvanizing shall be done after fabrication, in the largest sections possible. Items too large for available dip tanks shall be

sprayed, by approved methods, with molten zinc to coating thickness of 0.003 inch to 0.004 inch.

- B. Coating Weight: Weight of the Zinc coating per square foot of actual surface shall average not less than 2.0 ounces and no individual specimen shall be less than 1.8 ounces.
- C. Repair of Coating: Restore shop galvanized metal necessitating field soldering or welding which in any manner removes original galvanizing, by using galvanizing repair compound in accordance with manufacturer's instructions.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Field measure and Templates: Secure field measurements required for proper and adequate fabrication and installation. Furnish templates for exact location of items to be embedded in concrete and/or masonry including instructions required for installation.
- B. Temporary Shoring and Bracing: In accordance with California Code of Regulations (CCR), Title 8, design, provide temporary shoring, erection bracing and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are securely in place and final connections are complete. Provide temporary guy lines to achieve proper alignment of structure as erection proceeds.

3.2 ERECTION

- A. Setting Base and Bearing Plates: After the supported members have been plumbed, aligned and properly positioned, set base and bearing plates. Support plates on adjustable bolt supports or shims until grout has set. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Follow grout manufacturer's instructions.
- B. Framing: Except as specified herein, erect framing in accordance with AISC Code of Standard Practice and the 2022 CBC. Plan and layout framing so that cutting will not be required. Erect construction plumb, square, and true to line, level, and position indicated within tolerances established in the AISC Code of Standard Practice.
- C. Holding and Protection: In assembling and during welding hold the component parts with sufficient clamps or other adequate means to keep parts straight and in close contact. In welding, take precautions to minimize "lock-up" stress and distortion due to heat. In wind, perform welding only after adequate wind protection is furnished and set up.

- D. Connections: Bolt field connections except where welding is indicated. Perform welding as specified for shop welding.
- E. On exposed construction, remove erection bolts, temporary welds, run-off plates and backing strips. Fill erection bolt holes with plug welds and grind smooth.
- F. Testing shall comply with Section 01 4100.

Section continued on the next page

3.3 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of this Specification Section, unless a substitution product is being proposed, in which case refer to Division 1 Section "Substitutions" for Substitution requests.

Contractor's Contractor is to acknowledge with initials each submittal included. Attach a letter of explanation for each submittal not included.

Initials

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE:

- _____ 1. Fabricator's Qualifications
- _____ 2. Erector's Qualifications
- _____ 3. Mill test certificates including heat or melt numbers for each type and size of steel used in the Work.
- _____ 4. Shop and erection drawings including complete details and schedules for fabrication, shop and field assembly of members and erection bracing. Should more than one submittal be required, late submittals shall clearly identify materials added or revised subsequent to previous submittal.
 - a. Shop drawings and fabricated assemblies and members shall be properly marked to identify their location on site.
 - b. Indicate each weld by AWS symbol, size, type and length of weld.
 - c. Provide setting drawings, templates and directions for installing anchor bolts and other steel assemblies into concrete and/or masonry.
 - d. Identify shop drawing details by reference to sheet and detail number of the Drawings.
- _____ 5. Welder's Certificates: Certify welders employed on the Work, verify AWS qualification within the previous 12 months.

END OF SECTION 05 1200

SECTION 053100 - METAL DECK**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Roof metal deck where metal deck is indicated on the plans.

1.2 RELATED SECTIONS

- A. Section 051200: Structural Steel
- B. Section 033000: Cast-In-Place Concrete

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who have a minimum of five years experience in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work.
- B. When the materials are used as part of an assembly indicated on the plans in which fire-resistive construction ratings are required, submit specifications demonstrating approval by Underwriters' Laboratories, Inc., and DSA.
- C. Welders shall be AWS Certified for welding of light gauge metal materials.

1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.
- B. Refer to "Submittal Requirements and Schedules" Article at the end of this Section for required submittals.

PART 2 – PRODUCTS

2.1 METAL DECK UNITS

Properties:

- A. The metal deck shall conform to the following requirements:
 - 1. Awning deck shall be Verco PLB-36 complying with ASTM A653, grade 50.
 - 2. The depth, gauge, and structural properties shall be adequate to resist all Dead, Live, and short term loading.
 - 3. The configuration, depth and gauge of deck shall conform to requirements noted on plans.

2.2 ACCESSORIES

- A. Provide accessories specifically designed to be used with the metal deck units, including, but not necessarily limited to, ridge and valley plates, closures, cant strips, and sump pans if required.
- B. Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which the Work will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Prior to start of installation, verify that beams are in proper alignment and that surfaces are clean for connections and welding.
- B. Place each metal deck unit on the supporting steel framework, and adjust to final position prior to permanent attachment and welding.
- C. Complete installation of the metal deck work in accordance with the manufacturer's recommendations.

- D. Welding shall comply with AWS D1.3.

3.3 TOUCH-UP

- A. Upon completion of installation, and as a condition of its acceptance, visually inspect each item installed and locate surfaces where finish was damaged.
1. Touch-up galvanized surfaces with zinc-rich primer or other galvanized repair paint approved for repair purposes by the Architect.
 2. Touch-up other damaged surfaces as required to return the surfaces to the undamaged condition.

3.4 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of this Specification Section, unless a substitution product is being proposed, in which case refer to Division 1 Section "Substitutions" for Substitution requests.

Contractor's Contractor is to acknowledge with initials each submittal included. Attach a letter of explanation for each submittal not included.

Initials

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE:

_____ 1. Metal deck.

_____ 2. Fasteners.

END OF SECTION 053100

SECTION 055000 - METAL FABRICATIONS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Miscellaneous framing and supports.
2. Miscellaneous steel trim.
3. Pipe downspouts and brackets.
4. Abrasive metal nosings.
5. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section include the following:

1. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Requirements:

1. Section 051200 "Structural Steel Framing" for steel framing, supports and other steel items attached to the structural-steel framing.

1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions 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.

1.3 ACTION SUBMITTALS**A. Product Data:**

1. Fasteners.
2. Shop primers.
3. Shrinkage-resisting grout.
4. Slotted channel framing.
5. Manufactured metal ladders.

6. Pipe downspouts.
 7. Abrasive metal nosings.
- 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. Countertop supports.
 2. Pipe downspout brackets.
 3. Miscellaneous framing and supports for applications where framing and supports are not specified in other Sections.
- C. Samples for Verification: For each type and finish of extruded nosing.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Welding certificates.
- B. Research Reports: For post-installed anchors.
- 1.5 QUALITY ASSURANCE
- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- 1.6 FIELD CONDITIONS
- A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. 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 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 A36/A36M.

- C. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- D. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
- E. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches or as indicated.
 - 2. Galvanized Steel: ASTM A653/A653M, structural steel, Grade 33, with G90 coating; minimum 0.108-inch nominal thickness.
- F. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

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 B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.
- D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; 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: 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 in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
- F. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.
- G. Post-Installed Anchors: Torque-controlled expansion anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099100 "Painting."
 - 1. Use primer that contains pigments that make it easily distinguishable from zinc-rich primer.
- B. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- F. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- G. Concrete: Comply with requirements in Section 033000 "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.

- 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. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 COUNTERTOP SUPPORTS

- A. Fabricate countertop supports from steel tubes of sizes indicated and for attachment to wood framing. Provide holes to receive 1/4-inch screws, 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
- B. Galvanize countertop supports located in exterior walls.

2.8 STEEL PIPE DOWNSPOUTS

- A. Fabricate steel pipe downspouts from ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 10) galvanized steel pipe.

- B. Provide galvanized steel brackets as indicated on Drawings.
- C. Prime steel pipe downspouts with primer specified in Section 099100 "Painting."

2.9 ABRASIVE METAL NOSINGS

- A. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Wooster Products Inc.; Supergrit Safety Treads Type 231BF.
 - 2. Source Limitations: Obtain units from single source from single manufacturer.
 - 3. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.
 - 4. Nosings:
 - 1) Square-back units, 3 inches wide, for casting into concrete steps.
- B. Provide anchors for embedding units in concrete, integral to units.
- C. Apply bituminous paint to concealed surfaces of cast-metal units.

2.10 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize bearing and leveling plates.
- C. Prime plates with zinc-rich primer.

2.11 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.

2.12 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.13 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M 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 galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 1. Shop prime with primers specified in Section 099100 "Painting" unless zinc-rich primer is indicated.
- 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. Items Indicated to Receive Primers Specified in Section 099100 "Painting": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
 5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."
- 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.

2.14 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.
- 3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS
- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor countertop brackets securely to wood framing with lag screws.
- 3.3 INSTALLATION OF ABRASIVE METAL NOSINGS
- A. Center nosings on tread widths unless otherwise indicated.
- B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.
- 3.4 INSTALLATION OF STEEL PIPE DOWNSPOUTS
- A. Anchor metal downspout boots to concrete or masonry construction to comply with manufacturer's written instructions.
- B. Secure downspouts terminations to downspouts and substrate per manufacturer's instructions.
- 3.5 INSTALLATION OF LOOSE 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 shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.6 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099100 "Painting."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

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SECTION 055213 - PIPE AND TUBE RAILINGS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Steel guards
2. Steel handrails.

1.2 COORDINATION

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS**A. Product Data:**

1. Nonshrink, nonmetallic grout.
2. Anchoring cement.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1.4 INFORMATIONAL SUBMITTALS**A. Welding certificates.**

- B. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE**A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:**

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

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. 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 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Flanges: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 STEEL RAILINGS

- A. Pipe: ASTM A53/A53M, 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.
- B. Plates, Shapes, and Bars: ASTM A36/A36M.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
- 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 C1107/C1107M. Provide grout specifically recommended by manufacturer for 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.

2.5 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.
 1. Clearly mark units for reassembly and coordinated installation.
 2. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately.
 1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
 2. 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.
 1. Provide weep holes where water may accumulate.
 2. Locate weep holes in inconspicuous locations.
- 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 welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.
- I. Form changes in direction as follows:
 1. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.

- J. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
- L. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
 - 1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
 - 2. Coordinate anchorage devices with supporting structure.

2.6 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel railings after fabrication.
 - 2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
 - 3. 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 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
 - 1. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 - 2. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 - 3. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 4. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 5. Align rails so variations from level for horizontal members do not exceed 1/4 inch in 12 feet.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 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.

3.3 ANCHORING POSTS

- A. 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 nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

3.4 CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.5 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.
- B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055213

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SECTION 061000 – ROUGH CARPENTRY

PART 1 – GENERAL

1.1 Related Documents

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 Section Includes

- A. Provide all labor, material, equipment and installation to complete framing and sheathing of interior walls and partitions as shown and specified.

1.3 Related Sections

061600 – Sheathing

1.4 References

- A. The latest editions of specifications and standards referenced herein and published by the following organizations apply to the Work of this Section only to the extent specified by the reference.

APA	American Plywood Association - Visual Inspection
ASTM	American Society for Testing and Materials.
AWPA	American Wood Preservers Association
DFPA	Douglas Fir Plywood Association
ICC	International Code Council
PS	Public Standards of the U.S. Department of Commerce, Bureau of Standards
CBC STDS	2022 California Building Code Standards
WCLIB	West Coast Lumber Inspection Bureau
WWPA	Western Wood Products Association

1.5 Submittals

- A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.
 - 1. Product data and current ICC Evaluation Service Reports for attachment accessories.
 - a. Framing Devices and framing connectors

b. Gun nails

1.6 Quality Assurance

- A. Codes and Standards: Perform Work in compliance with applicable requirements of governing authorities having jurisdiction.
1. Chapter 23 of the 2022 California Building Code (CBC).
 2. ANSI/AF&PA NDS-2018 National Design Specification for Wood Construction.
 3. Standard Grading Rules No. 17 of the WCLIB or the Standard Grading Rules of the WWP. Lumber to have visible grade stamp of an agency certified by the WCLIB.

1.7 Coordination

- A. Coordinate Work of this Section with Work of other Sections to be attached to, or built into, wood framing.

PART 2 – PRODUCTS

2.1 Lumber

- A. Moisture content: The maximum moisture content of framing lumber shall not exceed 19% just prior to enclosing or covering framing with plywood, gypsum wallboard and/or plaster. To ensure compliance, lumber up to 2 inch thick should be seasoned to a moisture content of 19% or less and be stamped "S-Dry". Lumber over 2 inch thick may be shipped unseasoned and stamped "S-Green".
- B. Structural lumber shall be S4S stress-marked Douglas Fir-Larch, manufactured and graded in accordance with WCLIB or WWP, with minimum grades as follows unless noted otherwise:
- | | |
|--------------------------------|-----------------|
| 1. Joists & Rafters | No. 2 |
| 2. 4x & 6x Beams/Headers | No. 1 or better |
| 3. Wall Studs | No. 2 |
| 4. Blocking, stripping & misc. | No. 2 |
- C. Grade stamp: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade species, moisture content at time of surfacing, and mill.

2.2 Accessory Materials

- A. All Nails shall be common wire nails with dimensions complying with CBC Table 2304.9.1, manufacture shall conform to Fed. Spec, FF-N-1-1 and shall be hot-dipped galvanized for exterior locations, high humidity locations and for treated wood; plain finish for other interior locations; size and type to suit application.
 - 1. Box nails and/or "Sinker" nails are not acceptable for Work shown and/or detailed on the Structural Drawings.
- B. Bolts, Nuts and Washers conforming to ASTM A-307 shall be hot-dipped zinc galvanized for exterior locations, high humidity locations and treated wood; plain finish for other interior locations.
- C. Anchor Bolts: ASTM A 307, non-headed type.
- D. Lag Screws, Lag Bolts, Pins and Wood Screws: Sized to suit application: hot-dipped zinc galvanized for exterior locations, high humidity locations and treated wood; plain finish for other interior locations. Comply with NDS Section 11.1.3.
- E. Framing connectors: current ICC Evaluation Services Report, sized and profiled to suit application; hot-dipped galvanized finish, manufactured by Simpson Strong-Tie Company, KC Metals, or approved equal.
- F. Gun Nails: Use Common Nails or current ICC Evaluation Services Report special gun nails of the same wire diameter and length as common nails specified on the Drawings. Box nails and/or "Sinker" nails are not acceptable for Work shown on the Structural Drawings.
- G. Drypack: Cement/sand drypack composed of one part cement to 3 parts sand. Dry mix first then add with only enough water to hold the mix together. Drypack required under sills as noted on the Drawings.

2.3 Wood Treatment

- A. Wood Preservative (Pressure Treatment): Chromated zinc chloride or Wolman salts for pressure treated members.
- B. Pressure treatment of Douglas Fir-Larch plates, nailers, ledgers and other exposed wood structures, shall be in accordance with the AWPAs standards for the purchase and preservation of treated timber, with a retention of a least 0.35 lb. Wolman salts, 0.75 lb chromated zinc chloride per cubic feet of lumber, or 0.30 lb. per cubic foot of Pentachlorophenol type "C" light solvent. In exposed conditions, the incising of the lumber shall be waived.
- C. Wood Preservative (Surface Application): Clear, manufactured by Woodlife, "Res" or equal.

PART 3 – EXECUTION

3.1 Wood Treatment

- A. Shop pressure treat and deliver to the site ready for installation all wood materials requiring pressure impregnated preservatives.
- B. Treat site-sawn ends and holes in pressure treated lumber.
 - 1. Apply preservative treatment in accordance with manufacturer's instruction.
 - 2. Allow site applied preservative to cure prior to erecting members.

3.2 Framing

- A. Layout, cutting and installation of framing shall be under the continuous supervision of a full-time carpenter foreman experienced in all phases of framing construction and exposed architectural framing required for the Work of this Section and on the Contract Drawings.
- B. Structural members shall not be cut for pipes, conduits, ducts, etc., unless specifically noted or detailed on the Structural Drawings.
- C. Erect wood framing members true to lines and levels. Do not deviate from true alignment more than 1/4 inch. Install simple span members with crown up.
- D. Space framing members at 16 inches on center unless otherwise noted on the Drawings.
- E. Construct members of continuous pieces of longest possible lengths except as noted on the Drawings.
- F. Holes in wood for bolts shall be drilled 1/32" to 1/16" larger than the diameter of the bolt.
- G. Number of fasteners shall be as indicated on the Drawings or as noted in the ICC Evaluation Report where number of fasteners are not shown on the Drawings.
- H. Sheet metal framing connectors shown on the Drawings shall be Simpson connectors as manufactured by the Simpson Strong-Tie Company, Inc., Superspeed Connectors as manufactured by the KC Metals company or equal.
- I. Bolts shall have standard cut washers under heads and/or nuts where in contact with wood. Bolt threads shall not bear on wood.
- J. Lag bolts, lag screws and wood screws shall be screwed (not driven) into wood members. In

placing lag screws or wood screws in wood, a hole of the same diameter and depth of "the solid shank" shall be bored after which the hole with a diameter equal to the diameter of the screw at the root of the thread shall be continued to a depth equal to the threaded screw length portion. Provide cut washers under the heads of lag bolts/lag screws where in contact with wood.

- K. Bolts, lag screws and wood screws shall be re-tightened prior to the application of drywall, plywood, plaster, etc.
- L. Drive nails perpendicular to grain of wood in lieu of toenailing, where feasible.
- M. For conditions not covered on the Drawings, provide penetration into the piece receiving the point of not less than 1/2 the length of the common nail or spike, provided, however, that 16d nails may be used to connect two pieces of two inch (nominal) thickness.

3.4 Clean-Up

- A. Clean up leftover materials of this Section and legally dispose off site. Dispose of pressure-treated wood in an authorized disposal area. Burning of materials on the Site is prohibited. Do not bury material and/or wood of any type on the job site.

END OF SECTION 06 1000

SECTION 061600 – SHEATHING**PART 1 – GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Provide all labor, material, equipment and installation to complete framing and sheathing of roof overlay, top of interior lids, mezzanine flooring, stairs and wall paneling in electrical and communications rooms as shown and specified.

1.3 RELATED SECTIONS

Section 06 1000 – Rough Carpentry

1.4 REFERENCES

- A. The latest editions of specifications and standards referenced herein and published by the following organizations apply to the Work of this Section only to the extent specified by the reference.

APA	American Plywood Association - Visual Inspection
ASTM	American Society for Testing and Materials.
AWPA	American Wood Preservers Association
DFPA	Douglas Fir Plywood Association
ICC	International Code Council
PS	Public Standards of the U.S. Department of Commerce, Bureau of Standards
CBC STDS	2022 California Building Code Standards
WCLIB	West Coast Lumber Inspection Bureau
WWPA	Western Wood Products Association
AISI STANDARD	North American Standard For Seismic Design of Cold-Formed Steel

1.5 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.
- B. Product data and current ICC Evaluation Service Reports for attachment accessories.
 - 1. Framing Devices and framing connectors
 - 2. Gun nails.

1.6 QUALITY ASSURANCE

- A. Codes and Standards: Perform Work in compliance with applicable requirements of governing authorities having jurisdiction.
 - 1. Chapter 23 of the 2022 California Building Code (CBC).
 - 2. ANSI/AF&PA NDS-2018 National Design Specification for Wood Construction.
 - 3. Standard Grading Rules No. 17 of the WCLIB or the Standard Grading Rules of the WWPA. Lumber to have visible grade stamp of an agency certified by the WCLIB.
 - 4. Structural plywood: DOC Product Standard PS 1. Plywood shall be grade marked by DFPA, TECO, APA or PTL.

1.7 COORDINATION

- A. Coordinate Work of this Section with Work of other Sections to be attached to, or built into, cold-formed metal framing.

PART 2 – PRODUCTS

2.1 SHEET MATERIALS

- A. Plywood shall conform to:
 - 1. All roof, floor and wall sheathing shall be APA rated Structural I plywood of the thickness shown on the Structural Drawings.
- B. Grade stamp: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade species, moisture content at time of surfacing, and mill.
- C. Environmental Requirement: All composite wood and agrifiber products including core

materials and all laminating adhesives, on site or shop applied, must contain no added urea-formaldehyde resins.

2.2 ACCESSORY MATERIALS

- A. Screws for structural members are minimum of #8 and comply with ASTM C1513.

2.3 WOOD TREATMENT

- A. Wood Preservative (Pressure Treatment): Chromated zinc chloride or Wolman salts for pressure treated members.
- B. Wood Preservative (Surface Application): Clear, manufactured by Woodlife, "Res" or equal.

PART 3 – EXECUTION

3.1 FRAMING

- A. Layout, cutting and installation of framing shall be under the continuous supervision of a full-time carpenter foreman experienced in all phases of framing construction and exposed architectural framing required for the Work of this Section and on the Contract Drawings.
- B. Structural members shall not be cut for pipes, conduits, ducts, etc., unless specifically noted or detailed on the Structural Drawings.
- C. Erect wood framing members true to lines and levels. Do not deviate from true alignment more than 1/4 inch. Install simple span members with crown up.
- D. Construct members of continuous pieces of longest possible lengths except as noted on the Drawings.
- E. Number of fasteners shall be as indicated on the Drawings or as noted in the ICC Evaluation Report where number of fasteners are not shown on the Drawings.
- F. Sheet metal framing connectors shown on the Drawings shall be Simpson connectors as manufactured by the Simpson Strong-Tie Company, Inc., Superspeed Connectors as manufactured by the KC Metals company or equal.

- G. Drive nails perpendicular to grain of wood in lieu of toenailing, where feasible.
- H. For conditions not covered on the Drawings, provide penetration into the piece receiving the point of not less than 1/2 the length of the common nail or spike, provided, however, that 16^d nails may be used to connect two pieces of two inch (nominal) thickness.

3.2 PLYWOOD SHEATHING

- A. Plywood sheathing shall be laid/placed with face grain perpendicular to supports. Secure plywood sheets over firm bearing with end joints staggered.
 - 1. Provide a 1/8 inch gap between plywood edges for wall sheathing for expansion and contraction. Do not force panels into place.
 - 2. Sheathing: Provide 18 ga. min. C stud blocking for unsupported edges.
- B. Plywood sheathing shall be screwed with #8 self-tapping screws with a minimum head diameter of 0.285 in. or #10 self-tapping screws with a minimum head diameter of 0.333 in. spaced at 3/8" from all edges. Refer to the Drawings for screw size and spacing requirements for all plywood sheathing.
- C. Use plywood panels larger than eight square feet and greater than 24" in the least dimension.

3.4 CLEAN-UP

- A. Clean up leftover materials of this Section and legally dispose off site. Dispose of pressure-treated wood in an authorized disposal area. Burning of materials on the Site is prohibited. Do not bury material and/or wood of any type on the job site.

END OF SECTION 061600

SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING**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. Modified bituminous sheet waterproofing.
 - 2. Drainage board.

- B. Related Requirements:

- 1. Section 030000 "Cast-In-Place Concrete" for building perimeter foundation/footing and sitework retaining wall waterproofing.

1.3 PREINSTALLATION MEETINGS

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

- 1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.4 ACTION SUBMITTALS

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

- 1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
 - 2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

- B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, expansion joints, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

- C. Samples: For each exposed product and for each color and texture specified, including the following products:

- 1. 12-by-12-inch square of waterproofing and flashing sheet.

2. 4-by-4-inch square of drainage panel.
3. 12-by-12-inch square of reinforcing fabric.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1. Engage an experienced applicator who has completed system applications similar in material and extent to that indicated for this Project with a record of five (5) years of successful in-service performance.

B. Installer Certificates: Signed by manufacturers certifying that installer comply with manufacturer's requirements and are capable of performing installations that will qualify for Manufacturer's Warranty.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for waterproofing.

D. Sample Warranties: For special warranties specified this Section.

1.6 QUALITY ASSURANCE

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

B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.

1. Build for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, and protection.
 - a. Size: 100 sq. ft.
 - b. Description: Each type of foundation/footing and retaining wall installation.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected locations and within temperature range required by waterproofing manufacturer.

- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Store rolls according to manufacturer's written instructions.
- E. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.9 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer's standard form in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
 - 2. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/8-inch in width.
- B. Installer's Special Warranty: On warranty form included at end of Section 016000 "Product Requirements", signed by Installer, covering Work of this Section.
 - 1. Warranty Period: Five years from date of Substantial Completion.
 - 2. Warranty includes removing and reinstalling protection board, drainage panels, and other materials required to reinstall corrective work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Waterproofing System: Obtain waterproofing materials from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: Minimum 60-mil (1.5-mm) nominal thickness, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated on one side to a 4-mil- (0.10-mm-) thick, polyethylene-film reinforcement, and with release liner on adhesive side.

1. Acceptable Products/Manufactures:
 - a. Bituthene 3000 by W.R. Grace & Co.
 - b. CCW MiraDRI 860/861 by Carlisle Coatings & Waterproofing.
 - c. Or approved equal.
2. Physical Properties:
 - a. Tensile Strength, Membrane: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.
 - b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
 - c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970/D 1970M.
 - d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836/C 836M.
 - e. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154/E 154M.
 - f. Water Absorption: 0.1 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
 - g. Water Vapor Permeance: 0.05 perm (2.9 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
 - h. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D 5385.
3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.3 AUXILIARY MATERIALS

- A. Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Liquid waterborne primer recommended for substrate by sheet-waterproofing material manufacturer.
- C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.
- D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.
- E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.
- F. Mastic, Adhesives, and Tape: Liquid mastic and adhesives and adhesive tapes recommended by waterproofing manufacturer.
 1. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2-inches wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.
 2. Detail Strips: 62.5-mil-thick, felt-reinforced self-adhesive strip, 9-inches wide, with release film on adhesive side.

- G. Protection Course: Fan folded, with a core of extruded-polystyrene board insulation, nominal thickness 1/4 inch (6 mm), with compressive strength of not less than 8 psi (55 kPa) per ASTM D 1621, and maximum water absorption by volume of 0.6 percent per ASTM C 272/C 272M.

2.4 MOLDED-SHEET DRAINAGE PANELS

- A. Woven-Geotextile-Faced, Molded-Sheet Drainage Panel with Polymeric Film: Composite subsurface drainage panel acceptable to waterproofing manufacturer and consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a woven-geotextile facing with an apparent opening size not exceeding No. 40 sieve, laminated to one side of the core and a polymeric film bonded to the other side; and with a horizontal flow rate through the core of not less than 3.8 gpm per ft.
 - 1. Acceptable Products/Manufactures:
 - a. Hydroduct 220 for vertical applications; Hydroduct Coil 660 for horizontal applications by W.R. Grace & Co.
 - b. CCW MiraDRAIN 6200 for vertical applications; CCW MiraDRAIN 9000 for horizontal applications by Carlisle Coatings & Waterproofing.
 - c. Or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of waterproofing.
 - 1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
 - 2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
 - 1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/8 inch.
- F. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
 - 1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:
 - a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.
- G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

- A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and per recommendations in ASTM D 6135.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.
- C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch-minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.
 - 1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.
- D. Horizontal Application: Apply sheets from low to high points to ensure that laps shed water.
- E. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.
- F. Seal exposed edges of sheet-waterproofing terminations and then conceal by metal counterflashings or ending in reglets with mastic.
- G. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.
- H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

- I. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- J. Carry self-adhering sheet waterproofing a minimum of ten (10) feet past any interior room.

3.4 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from foundation/footing or wall substrate, according to manufacturer's written instructions. Use adhesives that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
 - 1. For vertical applications, install protection course, according to manufacturer's written instructions, before installing drainage panels.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components; and to furnish daily reports to Architect.
- B. Waterproofing will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.6 PROTECTION, REPAIR, AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- E. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 071326

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SECTION 071910 - CONCRETE FLOOR SEALER**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. Floor sealers installed at cast-in-place concrete floors at interior back of house areas (electrical rooms, data rooms and mechanical rooms) to prevent concrete dusting. Not for high profile or decorative areas.
- B. Related Requirements:
 - 1. Section 030130 "Maintenance of Cast-in-Place Concrete" for existing concrete slabs.
 - 2. Section 033000 "Cast-in-Place Concrete."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's printed statement of VOC content.
 - 2. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Applicator.
- B. Product Certificates: For concrete sealant.
- C. Sample Warranty: For special warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.
- B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.

- B. Mockup: Prepare a representative area of no less than 10 ft. by 10 ft. (and no more than 10% of the total floor area) to confirm surface preparation procedures, coverage rate, reaction time, finished appearance, etc. Use the manufacturers' application instructions. Let test area dry thoroughly before inspection. Keep test area available for comparison throughout the project.

1.7 FIELD CONDITIONS

- A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit concrete sealers to be applied according to manufacturers' written instructions and warranty requirements:
 - 1. Concrete surfaces have cured for not less than 28 days.
 - 2. Ambient temperature is above 40 deg F and below 100 deg F and will remain so for 24 hours.
 - 3. Substrate is not frozen and substrate-surface temperature is above 40 deg F and below 100 deg F.
 - 4. Rain is not predicted within 24 hours.
 - 5. Not less than 24 hours have passed since surfaces were last wet.
- B. Close areas to traffic during sealant application and, after application, for time period recommended in writing by manufacturer.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Applicator agree(s) to repair or replace materials that fail to maintain water repellency specified in Part 1 "Performance Requirements" Article within specified warranty period.
 - 1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ENVIRONMENTAL REQUIREMENTS

- A. General: Sealants applied on the interior of the building envelope shall comply with South Coast Air Quality Management District (SCAQMD) Rule 1168.

2.2 CONCRETE SEALER

- A. Basis-of-Design Product Subject to compliance with requirements provide PROSOCO, Inc.; Consolideck LS or comparable product from one of the following:
 - 1. ChemMasters.
 - 2. Degussa.
 - 3. L.M. Scofield.
 - 4. Or approved equal.
- B. Concrete Sealer:
 - 1. Premium hardener, densifier and sealer for concrete surfaces.
 - 2. Penetrating lithium silicate treatment reacts with the concrete to produce insoluble calcium silicate hydrate within the concrete pores.

3. Treated surfaces resist damage from water and surface abrasion.
4. Reduces dusting and simplifies maintenance.
5. Will not trigger or contribute to surface ASR (alkali silicate reaction).
6. Technical Data:
 - a. Form: Clear, water-like liquid.
 - b. pH: 11.0.
 - c. Weight per Gallon: 9.2 pounds.
 - d. Active Content: 14.5 percent.
 - e. Total Solids: 14.5 percent.
 - f. VOC Content: 0 grams per Litter. Complies with all known national, state and district AIM VOC regulations.
 - g. Flash Point: Not flammable.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surfaces to be treated must be clean, dry and absorbent. Test surface absorbency with a light water spray. If surface does not wet uniformly, use manufacturer's appropriate surface preparation cleaner or mechanical process to remove remaining surface contaminants.

3.2 CALCULATING TARGET COVERAGE RATE

- A. Prepare the test section in accordance with manufacturer's published preparation information. Surface must be clean, dry and absorbent. Surfaces should wet uniformly.
- B. Pour one gallon of product into a clean pump up sprayer. Lightly apply sufficient product to wet the surface without producing puddles.
- C. Use a clean microfiber pad to spread the product and ensure uniform wetting. Scrubbing is not necessary.
- D. If surfaces dry immediately, increase your rate of application. Surface should remain wet for 5–10 minutes. Adjust rate of application to eliminate puddles.
- E. Repeat steps 2 through 4 as needed to determine the correct rate of application. Measure the test area to establish the Target Coverage Rate per gallon.

3.3 APPLICATION INSTRUCTIONS

- A. At Freshly Placed, Uncured Steel-Troweled Concrete:
 1. After final finishing, soft cut control joints. Clean concrete of any dirt, residue or soft cut saw debris.
 2. Using a low pressure sprayer fitted with a 0.5 gallon per minute tip, apply a single coat of sealer. Lightly apply sufficient product to wet the surface without producing puddles.
 3. Use a clean, soft bristle push broom or microfiber pad to spread the product evenly and ensure uniform wetting. Avoid spreading once drying begins. Scrubbing is not necessary.
 4. If surfaces dry immediately, increase the rate of application. Surface should remain wet for 5 to 10 minutes. Adjust rate of application to eliminate puddles. Allowing excess material to puddle on the

floor will extend dry times and create white residues which must be removed immediately. Allow treated surfaces to dry.

5. Immediately apply the specified curing compound or initiate the specified curing procedure.
6. When the curing process is complete, use an automatic floor scrubber equipped with cleaning pads or brushes appropriate for removal of accumulated construction soiling and surface residues. Avoid pads or brushes which may damage the finished floor.

B. At Cured, Steel Troweled Concrete:

1. Remove all dirt, debris, or curing compounds using the appropriate surface prep cleaner. Allow cleaning waters used in surface preparation to dry.
2. The prepared surface must wet uniformly. Confirm surface absorbency with a light water spray. In hot, dry weather, pre-wet the concrete with fresh water. Allow any standing water to evaporate.
3. Apply a single coat using a low pressure sprayer fitted with a 0.5 gallon per minute spray tip. Apply sufficient product to wet the surface without producing puddles. Use a clean, soft bristle push broom or microfiber pad to spread the product evenly and ensure uniform wetting. Avoid spreading once drying begins. Scrubbing is not necessary.
4. If surfaces dry immediately, increase the rate of application. Surface should remain wet for 5–10 minutes. Adjust rate of application to eliminate puddles. Allowing excess material to puddle on the floor will extend dry times and create white residues which must be removed immediately.
5. Allow treated surfaces to dry.
6. Remove any dried powder residue using a stiff broom, power sweeper or auto-scrubbing machine.

- C. Cleanup: Before product dries, clean tools and equipment with fresh water. Immediately wash off over spray from glass, aluminum, polished or other surfaces with fresh water.

END OF SECTION 071910

SECTION 072100 - 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 insulation.

- B. Related Requirements:

- 1. Section 072119 "Foamed-in-Place Insulation" for spray-applied polyurethane foam thermal insulation.
 - 2. Section 075419 "Polyvinyl-Chloride (PVC) Roofing" for insulation specified as part of roofing construction.
 - 3. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

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 PERFORMANCE REQUIREMENTS**

- A. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes less than Class A, 25 and 450 when tested in accordance with ASTM E84.

- B. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- C. Thermal-Resistance Value (R-Value): R-value as indicated on Drawings in accordance with ASTM C518.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:
 - 1. CertainTeed Corporation; Saint-Gobain North America.
 - 2. Johns Manville; a Berkshire-Hathaway company.
 - 3. Knauf Insulation.
 - 4. Owens Corning.
- B. Sustainable Requirements: Glass-fiber blanket insulation manufactured with 100 percent acrylic binders and no urea formaldehyde.
- C. Glass-Fiber Sound Attenuation Blanket Insulation, Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics.
 - 1. To be installed at interior walls.
- D. Glass-Fiber Blanket Insulation, Polypropylene-Scrim-Kraft Faced: ASTM C665, Type II (nonreflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).
 - 1. To be installed at exterior frame walls.

2.3 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
 - 2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

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. For wood-framed construction, install blankets according to ASTM C1320.
 - 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.
 - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.4 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

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SECTION 072119 – FOAMED-IN-PLACE 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. Open-cell spray polyurethane foam for use as thermal insulation and air barrier at enclosed roof assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Open-cell spray polyurethane foam insulation.
 - 2. Accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ES.
- C. Qualification Data: For Installer.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS**2.1 OPEN-CELL SPRAY POLYURETHANE FOAM**

- A. Open-Cell Spray Polyurethane Foam: Spray-applied polyurethane foam using water as a blowing agent. Minimum density of 0.4 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 3.4 deg F x h x sq. ft./Btu at 75 deg F.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:
 - a. BASF Corporation.
 - b. CertainTeed Corporation.
 - c. Icynene Inc.
 - d. Johns Manville; a Berkshire Hathaway company.
2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
3. Fire Propagation Characteristics: Passes NFPA 276 testing as part of an approved assembly.

2.2 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.
- B. Thermal Barrier: Material barrier intended to prevent flame-source access to foam and delay temperature-rise of foam during a fire event.
 1. Gypsum Wallboard: 0.5-inch minimum thickness.
 2. Thermal Barrier Coating: Fire-protective intumescent coating formulated for application over polyurethane foam plastics, compatible with insulation, and passes NFPA 275 testing as part of an approved assembly.
 3. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 50 or less.
 4. Topcoat: 8- to 12-mil- thick, heavy-duty protective coating recommended in writing by intumescent thermal barrier manufacturer as compatible with substrate materials.
- C. Ignition Barrier: Material providing a 15-minute minimum fire-ignition barrier.
 1. Gypsum Wallboard: 0.325-inch (9.5-mm) minimum thickness.
 2. Ignition Barrier Coating: Fire-protective coating formulated for application over polyurethane foam plastics, compatible with insulation, and in compliance with ICC-ES AC377, Appendix X.
 3. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- a. Flame-Spread Index: 25 or less.
- b. Smoke-Developed Index: 50 or less.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.
- B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Spray insulation to envelop entire area to be insulated and fill voids.
- C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.
- D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.
- E. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.3 PROTECTION

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

END OF SECTION 072119

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SECTION 072500 – WEATHER BARRIERS**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. Complete water-resistive barriers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show details of building paper at terminations, openings, and penetrations. Show details of flexible flashing applications.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.
- B. Sample Warranty: For manufacturer's standard warranty.

1.5 WARRANTY

- A. Moisture Control System Warranty
 - 1. Manufacturer to warrant that weather barrier system will perform to published specifications when installed according to manufacturer's installation procedures and accepted industry standards. In the event of a warranty claim, manufacturer will pay the cost of materials and labor to correct leaks that result solely from the failure of moisture control system products.
 - 2. Warranty Period: 15 years.

PART 2 - PRODUCTS**2.1 SOURCE LIMITATIONS**

- A. Obtain complete weather barrier system from single manufacturer.

2.2 WATER-RESISTIVE BARRIER MATERIALS

- A. Drainable Barrier Sheet: Multi-layer nonwoven and nonperforated polypropylene with rain screen matrix bonded on back side.

1. Width: 4.4 feet, minimum.
2. Water Vapor Permeance: 19 perms, minimum, when tested in accordance with ASTM E96/E96M Using Procedure A – Desiccant Method, at 73.4 degrees F.
3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 180 days of weather exposure.
4. Weather barrier shall comply with CBC Chapter 25, 2510.6.2 for Moist or marine climates.
 - a. A drainage material of not less than 4.8 mm shall be applied on the exterior side of water-resistive barrier.
 - b. Drainage shall have an efficiency of 90 percent in accordance with ASTM E2273 or Annex A2 of ASTM E2925.
5. Products:
 - a. VaproShield: WrapShield RS: vaprosshield.com
 - b. Tamlyn: TamlynWrap Rain Screen 6.3: www.tamlyn.com
 - c. Kingspan Insulation LLC: GreenGuard RainDrop 3D Building Wrap www.kingwspaninsulation.us

2.3 ACCESSORIES

- A. Sealants, Tapes, and Accessories used for sealing Water-Resistive Barrier and adjacent substrates: As indicated or complying with water-resistive barrier manufacturer's installation instructions
- B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof. Width is 4 inches.
- C. Liquid Flashing: One part, fast curing, nonsag, elastomeric, gun grade, trowelable liquid flashing.
 1. Products:
 - a. VaproShield™ VaproLiqui-Flash: vaprosshield.com
 - b. Or as approved by the weather-resistive barrier manufacturer for use with their product.
- D. Thinners and Cleaners: As recommended by water-resistive barrier manufacturer.
 1. Max VOC: 9 g/L; ASTM D3960.
 2. Compatibility: Chemically compatible with flexible flashing; AAMA 713.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surface and conditions comply with the requirements of this section.

3.2 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with installation.
- B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions

3.3 INSTALLATION

- A. Install material in accordance with manufacturer's installation instructions.
- B. Water-Resistive Barriers: Install continuous water-resistive barrier over surfaces indicated with sheets lapped to shed water but with seams not sealed.
- C. Air Barriers: Install continuous airtight barrier over surfaces indicated with sealed seams and with sealed joints to adjacent surfaces. Seal joints between slab or curb and wall above.
- D. Mechanically Fastened Exterior Sheets:
 - 1. Install sheets shingle fashion to shed water with seams aligned horizontal.
 - 2. Overlap seams as recommended by manufacturer, 6 inches minimum.
 - 3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches minimum.
 - 4. Attach to framed construction with fasteners extending through sheathing into framing and space fasteners at 12 to 18 inches on center along each framing member supporting sheathing.
 - 5. For applications indicated to be airtight seal seams, laps, penetrations, tears and cuts with self-adhesive tape. Use only large headed, gasketed fasteners as recommended by manufacturer.
 - 6. Install water-resistive barrier over jamb flashings.
 - 7. Install head flashing under water-resistive barrier.
 - 8. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges, at head of opening seal sheet over flange and flashing.
- E. O-openings and Penetrations in Exterior Water-Resistive Barriers;
 - 1. Install flashing over sills, covering entire sill framing member and extend at least 5 inches onto water-resistive barrier and at least 6 inches up jambs, mechanically fasten stretched edges.
 - 2. At openings filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide, do not seal sill flange.

3. At openings filled with nonflanged frames, seal water-resistive barrier to each side of framing at opening using flashing at least 9 inches wide and covering entire depth of framing.
4. At head of openings, install flashing under water-resistive barrier extending at least at least 2 inches beyond face of jambs, seal water-resistive barrier to flashing.
5. At interior face of openings, seal gaps between window and door frames and rough framing using appropriate joint sealant over backer rod.
6. Service and other Penetrations: Form flashing around penetrating items and seal to surface of water-resistive barrier.

3.4 FIELD QUALITY CONTROL

- A. See section 014000- Quality Requirements for additional requirements.
- B. Owner's Inspection and Testing: cooperate with owner's testing agency
 1. Allow access to work areas and staging.
 2. Notify Testing agency in writing of schedule for work of this section to allow sufficient time for testing and inspection.
 3. Do not cover work of this section until testing and inspection is accepted
- C. Take digital photographs of each portion of installation prior to covering up weather barriers.

3.5 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION 07250

SECTION 072600 - REINFORCED VAPOR RETARDERS FOR UNDER SLABS**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. Reinforced vapor retarders for under concrete slab applications.
- B. Related Sections:
 - 1. Division 03, Section "Cast-in-Place Concrete".
 - 2. Division 31 Earthwork Sections for subgrade below reinforced vapor retarder.

1.3 REFERENCES

- A. ASTM D 882- Tensile Properties of Thin Plastic Sheeting.
- B. ASTM D 1709- Impact Resistance of Plastic Film by Free-Falling Dart Method.
- C. ASTM D 2582- Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
- D. ASTM D 3776- Mass per Unit Area (Weight) of Woven Fabric.
- E. ASTM D 4833- Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.
- F. ASTM E 96- Water Vapor Transmission of Materials.
- G. ASTM 1643- Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

1.4 SUBMITTALS

- A. Comply with Division 01 Section 013300 "Submittal Procedures".
- B. Product Data: Submit manufacturer's product data, including installation instructions.
- C. Samples: Submit manufacturer's samples of reinforced vapor retarders.

1.5 QUALITY ASSURANCE

- A. Pre-Installation Meeting: Convene a pre-installation meeting two (2) weeks before start of installation of reinforced vapor retarders. Require attendance of parties directly affecting work of this section, including Contractor, Architect and Installer. Review installation, protection and coordination with other work.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage: Store materials in a clean, dry area in accordance with manufacturer's instructions.
- C. Handling: Protect materials during handling and installation to prevent damage.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Reef Industries, Inc., 9209 Alameda Genoa Road, Houston, Texas 77075.
Toll Free (800) 231-6074. Phone (713) 507-4251. Fax (713) 507-4295.
Web Site www.reefindustries.com E-Mail ri@reefindustries.com

2.2 REINFORCED VAPOR RETARDERS FOR UNDER CONCRETE SLABS

- A. Reinforced Vapor Retarder: Griffolyn Type-65 G
 - 1. Material: 3-ply laminate, combining 2 layers of high-density polyethylene and 2 high- strength non-woven cord grid.
 - 2. Weight, ASTM D 3776: 82 lb/ 1,000 ft².
 - 3. Puncture Propagation Tear, ASTM D 2582: 62 lb.
 - 4. Permeance (Perm), ASTM E 96: 0.038 grains/ hr- ft² - in Hg.
 - 5. Drop Dart, ASTM D 1709 Method B: 5 lbs.
 - 6. Tensile Strength, 3 inches, ASTM D 882: 190 lb/ 5,442 psi.
 - 7. Puncture Strength, ASTM D 4833: 60 lb.
 - 8. Classification, ASTM E 1745: Class A.
 - 9. Usable Temperature Range: -25 to 170 degrees F.

2.3 ACCESSORIES

- A. General: Ensure accessories are from same manufacturer as reinforced vapor retarders.
- B. Mastic Tape: Griffolyn Fab Tape.
 - 1. Description: Black, double-sided, asphaltic, pressure-sensitive, mastic tape.
 - 2. Weight: 3.75 pounds per 100 feet.
 - 3. Thickness: 35 mils.

- 4. 3 inch Seam Shear: 35 pounds.
- C. Self-Adhesive Repair Tape: Griffolyn Griff-Tape.
- D. Pipe Boots: Griffolyn pipe boots, factory-fabricated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive reinforced vapor retarders. Notify Architect if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

3.2 INSTALLATION

- A. Install reinforced vapor retarders in accordance with ASTM E 1643 and manufacturer's instructions.
- B. Install vapor retarders continuously at locations under slab as indicated on the drawings. Ensure there are no discontinuities in vapor retarder at seams and penetrations.
- C. Install vapor retarders in largest practical widths.
- D. Ensure subgrade beneath vapor retarder is smooth, level and compacted with no sharp projections.
- E. Join sections of vapor retarder and seal penetrations in vapor retarder with mastic tape. Ensure vapor retarder surfaces to receive mastic tape are clean and dry.
- F. Ensure there is no moisture entrapment by vapor retarder due to rainfall or ground water intrusion.
- G. Immediately repair holes in vapor retarder with self-adhesive repair tape.
- H. Seal around pipes and other penetrations in vapor retarder with pipe boots in accordance with manufacturer's instructions.
- I. Seal edge around all concrete foundation intersections.

3.3 PROTECTION

- A. Protect reinforced vapor retarders from damage during installation of reinforcing steel and utilities and during placement of concrete slab or granular materials.
- B. Immediately repair damaged vapor retarder in accordance with manufacturer's instructions.

SECTION 072600

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SECTION 074113 - METAL ROOF PANELS**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. Prefinished, prefabricated standing-seam metal roof panels with continuous seams at sloped roofs.
 - 2. Roofing underlayment for high temperature applications.

- B. Related Sections:

- 1. Section 061000 "Miscellaneous Rough Carpentry"
 - 2. Section 061600 "Sheathing"
 - 3. Section 076200 "Sheet Metal Flashing and Trim"
 - 4. Section 077200 "Roof Accessories"
 - 5. Section 079200 "Joint Sealants"

1.3 REFERENCES

- A. Reference Standards:

- 1. ASCE 7: Minimum Design Loads for Buildings and Other Structures.
 - 2. ASTM A653: Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
 - 3. ASTM A792: Steel Sheet, 55 % Aluminum Zinc Alloy Coated by the Hot Dip Process.
 - 4. ASTM C1371: Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
 - 5. ASTM C1549: Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
 - 6. ASTM D523: Specular Gloss.
 - 7. ASTM E1592: Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
 - 8. ASTM E283: Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - 9. ASTM E331: Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

10. ASTM E1646: Water penetration with factory applied continuous sealant, no leakage at 6.24 psf
11. ASTM E1918: Measuring Solar Reflectance of Horizontal and Low Sloped Surfaces in the Field.
12. ASTM E1980: Calculating Solar Reflectance Index of Horizontal and Low Sloped Opaque Surfaces.
13. CRRC-1 Method #1: Measuring Solar Reflectance of a Flat, Opaque, and Heterogeneous Surface Using a Portable Solar Reflectometer.
14. SMACNA Architectural Sheet Metal Manual.
15. UL 580: Standard for Tests for Uplift Resistance of Roof Assemblies
16. US Environmental Protection Agency: Energy Star Reflective Roof Products

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
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 structural loading limitations of deck, purlins and rafters during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; thickness and dimensions of parts; details of edge conditions, transitions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details, including thermal expansion and contraction provisions.
 2. Indicate locations of field- and factory-applied sealant.
 3. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
1. Submit standard color samples of metal for Architect's selection.
 2. Include similar Samples of trim and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
1. Metal Panels: Two 12 inch long by actual panel width samples showing proposed metal thickness and seam profile. Include clips, fasteners, closures, and other metal panel accessories.
 2. Submit samples in selected color of metal for Architect's verification.

1.6 INFORMATIONAL SUBMITTALS

- A. Manufacturer Qualifications.
- B. Installer Qualification Data: Submit list of completed projects, with names and contact information for architects and contractors.
- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- D. Field quality-control reports.
- E. Sample Warranties: For special warranties.
- F. Wind Clamps for Metal Roofs: Product Data & Sample

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: An entity with a minimum of 10 years' experience in factory fabrication and metal panels.

- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer and as follows:
 - 1. Three years' experience, minimum, in application of metal roof panels.
 - 2. Five satisfactory projects with metal panel work of similar scope and complexity to Work of this Project.
 - 3. Installer approved by manufacturer.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups for typical roof area only, including accessories.
 - a. Size: 10 feet by 10 feet or larger as required to show at least two pattern repeats, and in same orientation as façade designated by Architect.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water, and to protect panels against standing water and condensation between adjacent surfaces. Store metal panels to protect from damage or discoloration. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
 - 1. If panels become wet, immediately separate sheets, wipe dry with clean cloth, and keep sheets separate for air-drying.
- D. Painted panels shall be shipped with strippable protective coating between panels. Retain strippable protective covering on metal panels during installation. Do not allow strippable film coating to remain on panels in extreme heat, cold, or direct sunlight or other UV source.
- E. Do not allow panels to contact treated lumber.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Examine the conditions and substrates in which metal roofing work is to be installed. Substrate shall be installed level, flat and true to avoid panel stresses and distortion.

1.11 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

- A. Manufacturer's Warranty:
 - 1. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - a. Failures include, but are not limited to, the following:
 - 1) Structural failures including rupturing, cracking, or perforation/puncturing.
 - 2) Deterioration of metals and other materials beyond normal weathering.
 - b. Warranty Period: 25 years from date of Substantial Completion.
 - 2. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - a. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - 1) Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - 2) Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - 3) Cracking, checking, peeling, chipping, perforation, or failure of paint to adhere to bare metal.
 - b. Finish Warranty Period: 30 years from date of Substantial Completion.

- B. Installer Special Warranty: Warranty panels, flashings, sealants, fasteners and accessories against defective materials and/or workmanship, covering repairs required to maintain roof panels watertight and weatherproof with normal usage for two years following Project Substantial Completion date.
 - 1. Furnish written warranty, signed by Installer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:
 - 1. Three-year, aged solar reflectance of not less than 0.20 and emissivity of not less than 0.75.
 - 2. Three-year, aged Solar Reflectance Index of not less than 29 when calculated according to ASTM E 1980.
- B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- C. Air Infiltration: Air leakage less than 0.02 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 20.0 lbf/sq. ft.
- D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 25.0 lbf/sq. ft.
- E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: UL 90.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panel assembly designed to be installed by covering vertical side edges of adjacent panels with battens and mechanically attaching panels to supports using concealed clips. Include battens and accessories required for weathertight installation.
- B. Concealed Fastener Standing Seam:
 - 1. Basis-of-Design: Design Span HP by AEP Span, a Division of ASC Profiles, Inc.
 - 2. Metallic-Coated Steel Sheet: Aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 22 gauge.
 - b. Panel Coverage: 18 inches (o.c. spacing).
 - c. Batten Height: 1.75 inch.
 - d. Exterior Finish: Provide primer and top finish coat on exposed faces; provide primer and backer coat on concealed faces of panels.
 - 1) DuraTech 5000, DuraTech mx, or Zinalume Plus finish system as selected by Architect.
 - 2) Color: As selected by Architect from manufacturer's full range.
 - 3. Clips: One-piece fixed to accommodate thermal movement.
 - a. Material: UL 90 18 gauge G-90 Galvanized steel, 40 ksi yield strength, 3 1/2" long triple fastener type.
 - 4. Bearing Plates: 24 gauge 4"x6" Zinalume coated steel bearing plate. Refer to Metal Construction Association Technical Bulletin "Fastener Selection."
 - 5. Sealant: Gunnable Grade Caulking, single component polyurethane caulk.
 - 6. Fasteners: As indicated on Drawings.
 - 7. Tape Sealant: high-grade butyl mastic sealant within the confines of narrow batten, designed to seal against adjacent male panel legs.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 45 mils thick, specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer when recommended by underlayment manufacturer.
 - 1. Fire Resistance: Class A; ASTM E 108.
 - 2. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.
 - 3. Low-Temperature Flexibility: Passes after testing at minus 40 deg F; ASTM D 1970.
 - 4. Basis-of-Design: Titanium PSU30 by InterWrap Roofing Products Division; Charleston, SC; (888) 713-7663; www.InterWrap.com/titanium.

- B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch-long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.
- E. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot-long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.
- F. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal roof panel manufacturer for application, but not less than thickness of metal being secured.

2.6 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 - 1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
 - 2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not

less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.
- B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.
- C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.4 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Batten-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each batten-seam joint at location, spacing, and with fasteners recommended by manufacturer.
 1. Install clips to supports with self-drilling fasteners.
 2. Apply battens to metal roof panel seams, fully engaged to provide weathertight joints.

3. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommended by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal roof panel manufacturer.
- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
 1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
 1. Connect downspouts to underground drainage system indicated.
- J. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal roof panel installation, including accessories. Report results in writing.
 - 1. Quality Assurance Inspections: Contractor to provide Manufacturer's Technical Services Inspections. Inspections shall be provided four (4) days plus an additional inspection at the rate of one (1) inspection day per 50 squares or fraction thereof.
- B. Remove and replace metal roof panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113

SECTION 075419 - POLYVINYL-CHLORIDE (PVC) ROOFING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Mechanically attached polyvinyl chloride (PVC) roofing system.
2. Accessory roofing materials.
3. Flat and tapered roof insulation.
4. Roof insulation cover board.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
2. Section 061600 "Sheathing" for wood-based, structural-use roof deck panels.
3. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings not included in this Section.
4. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.2 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.3 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.

8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include roof plans, sections, details, and attachments to other work.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Manufacturer Certificates:
 1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - a. Submit evidence of compliance with performance requirements.
 2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
- C. Product Test Reports: For roof membrane and insulation, tests performed by independent qualified testing agency indicating compliance with specified requirements.
- D. Evaluation Reports: For components of roofing system, from ICC-ES.
- E. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Qualifications:
 1. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.
 2. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
 3. Roofing Inspector Qualifications: A technical representative of manufacturer and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the

manufacturer to issue warranty certification. The Roofing Inspector shall be an authorized full-time technical employee of the manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, and other components of roofing system.
 - 2. Warranty Period: 25 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, and cover boards for the following warranty period:
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings to withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings to remain watertight.
 - 1. Accelerated Weathering: Roof membrane to withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
 - 2. Impact Resistance: Roof membrane to resist impact damage when tested according to ASTM D4434, ASTM D5635-04, ASTM D5602-98 or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- B. Flashings and Fastening: Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:
 - 1. FM Global 1-49: Loss Prevention Data Sheet for Perimeter Flashings.
 - 2. FM Global 1-29: Loss Prevention Data Sheet for Above Deck Roof Components.
 - 3. NRCA Roofing Manual (Sixth Edition) for construction details and recommendations.
 - 4. SMACNA Architectural Sheet Metal Manual (Seventh Edition) for construction details.
 - 5. Comply with requirements of Division 07 Section "Sheet Metal Flashing and Trim".
- C. Material Compatibility: Roofing materials to be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- D. Energy Performance: Roofing system to have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested in accordance with ANSI/CRRC S100.
- E. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.2 POLYVINYL CHLORIDE (PVC) ROOFING SYSTEM

- A. PVC Sheet Type III: ASTM D4434/D4434M, glass-fiber reinforced.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Versico Corporation; VersiFlex PVC 80 reinforced PVC membrane, or comparable products by one of the following:
 - a. Johns Manville.
 - b. Sarnafil.
 - c. GAF.

2. Thickness: 80 mils.
3. Exposed Face Color: EnergySmart White.

- B. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.

2.3 ACCESSORY ROOFING MATERIALS

- A. General: Accessory materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 3. Plastic Foam Adhesives: 50 g/L.
 4. Single-Ply Roof Membrane Sealants: 450 g/L.
 5. Nonmembrane Roof Sealants: 300 g/L.
 6. Sealant Primers for Nonporous Substrates: 250 g/L.
 7. Sealant Primers for Porous Substrates: 775 g/L.
- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet.
- C. Bonding Adhesive: Manufacturer's standard, water based.
- D. Low-Rise, Urethane, Fabric-Backed Membrane Adhesive: Roof system manufacturer's standard spray-applied, low-rise, two-component urethane adhesive formulated for compatibility and use with fabric-backed membrane roofing.
- E. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- F. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by PVC roof membrane manufacturer.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
1. Basis-of-Design Product: Versico Versicore Tapered.
 2. Compressive Strength: 20 psi.

3. Size: 48 by 48 inches.
4. Minimum Thickness: 1/2 inch.
5. Slope:
 - a. Roof Field: 1/4 inch per foot and 1/2 inch per foot unless otherwise indicated on Drawings.

2.5 INSULATION ACCESSORIES AND COVER BOARD

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
 1. Basis-of-Design Product: Versico HPVX Fasteners and HPVX Plates
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
- D. Glass-Mat Gypsum Roof Board: ASTM C1177/C1177M, water-resistant gypsum board.
 1. Basis-of-Design Product: USG Securock Glass-Mat Roof Board.
 2. Thickness: 5/8 inch.
 3. Surface Finish: Factory primed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 1. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Coordinate installing roofing system components so insulation or roof boards are not exposed to precipitation or other sources of moisture.
- D. Comply with product manufacturer's most current requirements for installing insulation or roof boards.
- E. Install tapered insulation to conform to slopes indicated.
- F. Install insulation to achieve required thickness. Use at least 2 layers of insulation when the total insulation thickness exceeds 2.7 inches. Stagger joints in both directions at least 12 inches between layers.
 - 1. Where installing composite and non-composite insulation in two or more layers, install non-composite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
- G. Fill gaps exceeding 1/4 inch with insulation. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- H. Installation Method:
 - 1. Mechanically Fastened: Install layers of insulation or roof board and secure to deck using standard plates and fasteners at the spacing rate according to manufacturer.
 - 2. Urethane Adhered: Install layer/s of insulation or roof board and secure by adhering to substrate by using urethane board adhesive at the spacing rate and application method according to manufacturer.

3.5 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
 - 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 2. Cut and fit cover board tight to nailers, projections, and penetrations.
 - 3. Adhere cover board to substrate using adhesive as follows:
 - a. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3.6 INSTALLATION OF MECHANICALLY FASTENED ROOF MEMBRANE

- A. Unroll roof membrane and allow to relax before installing.
- B. Secure roof membrane with required fasteners and plates spaced a maximum of 12 inches on center depending on project conditions (centered over the pre-printed marks approximately 1 1/2 inches from the edge of the membrane sheet).
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- E. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- F. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roof membrane and sheet flashings to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- G. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.7 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 FIELD QUALITY CONTROL

- A. Roofing Inspector: Engage a qualified roofing inspector to perform roof tests and inspections and to prepare startup, interim and final reports.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.9 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

SECTION CONTINUES ON FOLLOWING PAGE

3.10 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner:
 2. Owner Address:
 3. Building Name/Type:
 4. Building Address:
 5. Area of Work:
 6. Acceptance Date: _____.
 7. Warranty Period:
 8. Expiration Date: _____.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning;
 - b. peak gust wind speed exceeding;
 - c. fire;
 - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on bottom of roofing; and
 - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 075419

SECTION 076200 - 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. Sheet metal materials.
 - a. Reglets
 - b. Copings
 - c. Counter Flashing
- 2. Underlayment.
- 3. Miscellaneous materials.

B. Related Requirements:

- 1. Section 055000 "Metal Fabrications" for steel pipe downspouts and brackets connected to aluminum downspouts.
- 2. Section 061000 "Rough Carpentry" for wood nailers, curbs and blocking.
- 3. Section 074113 "Metal Roof Panels" for installation of sheet metal flashing and trim integral with roofing.
- 4. Section 075419 "PVC Roofing" for installation of sheet metal flashing and trim integral with roofing.
- 5. Section 092400 "Cement Plastering" for installation of premanufactured reglets integral to cement plastering installation.

1.3 PREINSTALLATION MEETINGS**A. Preinstallation Conference: Conduct conference at Project site.**

- 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
- 3. Review requirements for insurance and certificates if applicable.
- 4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 6. Include details of termination points and assemblies.
 - 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 - 8. Include details of roof-penetration flashing.
 - 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
 - 10. Include details of connections to adjoining work.
 - 11. 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 and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For fabricator and installer.
- 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.
- B. Special warranty.

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 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof eave, including gutter, approximately 10 ft. long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.
 - 1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
 - 2. Protect stored sheet metal flashing and trim from contact with water.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 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 leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

- a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, 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: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METAL MATERIALS

- A. Manufacturers: Subject to compliance with requirements provide sheet metal flashing and trim by one of the following, or approved equal:
 1. Fry Reglet Corporation.
 2. Classic Gutter Systems
 3. A.B. Raingutters.
 4. Rutland Gutter Supply
- B. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- C. Aluminum Sheet: Coil-coated sheet, ASTM B209/B209M, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 1. Thickness: As indicated on Drawings.
 2. Surface: Smooth, flat.

3. Exposed Coil-Coated Finish:

- a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
4. Color: As selected by Architect from manufacturer's full range.
5. 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

- A. 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 D226/D226M for Type I and Type II felts.
 1. Basis-of-Design Product: As specified in Section 073113 "Asphalt Shingles."
 2. Source Limitations: Obtain underlayment from single source from single manufacturer.

2.4 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, 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.
 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 Aluminum Sheet: Aluminum or Series 300 stainless steel.
- C. 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.

- D. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.
- F. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
- G. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
 - 1. Material: Aluminum, 0.025 inch thick.
 - 2. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
 - a. Basis-of-Design Product: Fry Reglet ST Stucco Reglet with Springlok flashing.
 - 3. Finish: With manufacturer's standard gray polyester coating.

2.5 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
 - 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
 - 4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances:
 - 1. 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.
 - 2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- G. Seams:
1. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- H. Do not use graphite pencils to mark metal surfaces on aluminum items.

2.6 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate sill and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:
1. Aluminum: 0.032 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 water-resistant barriers have been installed over sheathing or backing substrate to prevent water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

- A. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, in accordance with manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.
 - 1. Lap horizontal joints not less than 4 inches.
 - 2. Lap end joints not less than 12 inches.

3.3 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
 - 1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.
 - 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
 - 5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
 - 6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
 - 8. Do not field cut sheet metal flashing and trim by torch.
 - 9. Do not use graphite pencils to mark metal surfaces.
- 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 uncoated-aluminum sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
 - 1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

- 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.
 - a. Form joints to completely conceal sealant.
 - b. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
 - c. Adjust setting proportionately for installation at higher ambient temperatures.
 - 1) Do not install sealant-type joints at temperatures below 40 deg F.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Rivets: Rivet joints in where necessary for strength.

3.4 INSTALLATION OF ROOF FLASHINGS

- A. Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard.
 - 1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
 - 2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. 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.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
 - 1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
 - 2. Extend counterflashing 4 inches over base flashing.
 - 3. Lap counterflashing joints minimum of 4 inches.
 - 4. Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.
- D. 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 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean off excess sealants.

3.7 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.
- C. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 076200

SECTION 077200 - ROOF 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. Roof hatch.
 - 2. Aluminum Ladder.
- B. Related Sections:
 - 1. Division 01 Section "Interior Air Quality (IAQ) Management".
 - 2. Division 07 Section "PVC Roofing"

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1.4 SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.
- C. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - 1. Size and location of roof accessories specified in this Section.
 - 2. Method of attaching roof accessories to roof or building structure.
 - 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
 - 4. Required clearances.

- D. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.
- E. Warranty: Sample of warranties for all products indicated.

1.5 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.6 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ROOF HATCH

- A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, integral metal cant, cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom.
 - 1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:
 - a. Basis-of-Design: Bilco Company (The), Type S Roof Hatch Model # S-50 Aluminum with LadderUp Safety Post Model # LU-4.
 - b. O'Keeffe's Inc.
 - c. Dur-Red Products.
- B. Type and Size: Single-leaf lid, 30 by 36 inches.
- C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.
- D. Construction: Aluminum sheet, 11 gauge with 2" of polyisocyanurate insulation and EPDM gasketing for weather-resistance.
 - 1. Finish: Mill with high solar reflective index.

- E. Hardware: Stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.

2.2 ALUMINUM LADDER

A. Aluminum Ladder:

1. Manufacturers: Subject to compliance with requirements, provide:
 - a. Standard Duty Channel Rail: Model 500 as manufactured by O'Keeffe's Inc.
 - b. Clear Anodic Finish: AA-M10C22A41 Mechanical finish as fabricated. Architectural Class I, clear coating 0.018 mm or thicker.
 - c. Aluminum Extrusions: Alloy 6063-T6 to comply with ASTM B221.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - a. All sealants and adhesives to be field-applied, within the building envelope must comply with VOC limits in Division 01 Section "Indoor Air Quality (IAQ) Management".
 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
- C. Roof-Hatch Installation:

1. Install roof hatch so top surface of hatch curb is level.
2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
3. Attach safety railing system to roof-hatch curb.
4. Attach ladder-assist post according to manufacturer's written instructions.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Division 09 painting Sections.
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07720

SECTION 077293 - SOFFIT PANELS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes complete system of concealed-fastener, lap-seam metal panels in the following applications:
 - 1. Metal soffit panels.
- B. Related Requirements:
 - 1. Section 055000: Metal Fabrications.
 - 2. Section 079200: Joint Sealants.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASCE 7: Minimum Design Loads for Buildings and Other Structures.
 - 2. ASTM A653: Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
 - 3. ASTM A792: Steel Sheet, 55 % Aluminum Zinc Alloy Coated by the Hot Dip Process.
 - 4. ASTM C1371: Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
 - 5. ASTM C1549: Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
 - 6. ASTM D523: Specular Gloss.
 - 7. ASTM E283: Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - 8. ASTM E331: Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 - 9. ASTM E1592: Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
 - 10. ASTM E1918: Measuring Solar Reflectance of Horizontal and Low Sloped Surfaces in the Field.
 - 11. ASTM E1980: Calculating Solar Reflectance Index of Horizontal and Low Sloped Opaque Surfaces.
 - 12. CRRC-1 Method #1: Measuring Solar Reflectance of a Flat, Opaque, and Heterogeneous Surface Using a Portable Solar Reflectometer.
 - 13. SMACNA Architectural Sheet Metal Manual.

1.3 SUBMITTALS

- A. Product Data.
- B. Shop Drawings:
 - 1. Indicate thickness and dimensions of parts, fastenings and anchoring methods, details and locations of joints, transitions and other provisions necessary for thermal expansion and contraction.
 - 2. Indicate locations of field- and factory-applied sealant.

- C. Samples:
 - 1. Submit two samples, 12 inches long by full panel width, showing proposed metal thickness and seam profile.
 - 2. Submit standard color samples of metal for Architect's selection.
- D. Manufacturer Qualifications.
- E. Installer Qualifications: Submit list of completed projects, with names and contact information for architects and contractors.
- F. Test Reports: Indicating compliance of products with project requirements.
- G. Warranty Documentation.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Ten years' experience, minimum, in factory fabrication of metal panels.
 - 2. Manufacturer shall carry \$2,000,000 liability insurance, minimum, for metal panel system.
- B. Installer Qualifications:
 - 1. Three years' experience, minimum, in application of metal roof or wall panels.
 - 2. Five satisfactory projects with metal panel work of similar scope and complexity to Work of this Project.
- C. Testing Agency Qualifications: Agency compliant with ISO/IEC Standard 17025, or an accredited independent agency recognized by the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement or ANSI.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements:
 - 1. Keep panels and accessory items dry.
 - 2. Protect against damage and discoloration.
 - 3. Handle panels with non-marring slings.
 - 4. Support panels to prevent permanent deformation.
 - 5. Store panels above ground, with one end elevated for drainage.
 - 6. Protect panels against standing water and condensation between adjacent surfaces.
 - 7. If panels become wet, immediately separate sheets, wipe dry with clean cloth, and keep sheets separate for air-drying.
 - 8. Painted panels shall be shipped with protective plastic sheeting or a strippable film coating between panels. Remove strippable film coating prior to installation. Do not allow strippable film coating to remain on panels in extreme heat, cold, or direct sunlight or other UV source.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard 25-year performance warranty, stating the following:
 - 1. Architectural fluorocarbon finish:
 - a. Will be free of fading or color change in excess of 5 Hunter delta-E units as determined by ASTM D2244-02.

- b. Will not chalk in excess of numerical rating of 8 when measured in accordance with standard procedures specified in ASTM D4214-98 method D659.
 - c. Will not peel, crack, chip, or delaminate.
 - d. Metal substrate will not rupture, fail structurally, or perforate.
- B. Installer's Warranty: Warrant panels, flashings, sealants, fasteners and accessories against defective materials and/or workmanship, covering repairs required to maintain wall panels watertight and weatherproof with normal usage for two years following Project Substantial Completion date.
 - 1. Furnish written warranty, signed by installer.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Products: Provide the following:
 - 1. AEP Span, a Division of ASC Profiles; **Vented Flush Panel or approved equal.**
- B. Substitution Limitations: **Substitutions will be considered in accordance with Section 012500 "Substitution Procedures".**
- C. Performance Criteria
 - 1. Wind Uplift: **As required by ASCE 7**
 - a. Panel system shall be ASTM E1592 tested under the supervision of an ANSI or ISO/IEC accredited laboratory and the laboratory shall issue the test report. Test data based on ASTM E330 is not acceptable.
 - b. Deflection Limits: Withstand wind loads with deflections no greater than **1/180** of the span.
 - 2. Thermal Movements: Accommodate thermal movement without buckling, joint opening, failure of connections, or other detrimental effects, through the following temperature changes:
 - a. 120 degrees F, ambient.
 - b. 180 degrees F, surface.

2.2 PANELS

- A. Panel: AEP Span, a Division of ASC Profiles; Flush Panel/ Vented Flush Panel
 - 1. Material: Steel conforming to ASTM A792.
 - a. **22 Gauge:** Yield strength 50,000 psi; with aluminum-zinc alloy coating conforming to ASTM A792, Class AZ50.
 - 2. Profile and Pattern:
 - a. Vented Flush Panel, with 1 rib
 - 3. Finishes:
 - a. Exterior Panel Finish: Provide primer and finish coat on exposed faces; provide backer coat on concealed faces of panels.
 - 1) DuraTech® 5000: Polyvinylidene Fluoride, full 70 percent Kynar 500/Hylar 5000, consisting of a baked-on 0.15-0.30 mil corrosion resistant primer and a baked-on 0.70-0.80 mil finish coat with a specular gloss of 8 to 15 when tested in accordance with ASTM D523 at 60 degrees.
 - 2) Exterior Panel Color: **As scheduled**

- b. Interior Panel Finish: Corrosion-resistant primer; primer coat dry film thickness: 0.15 mils; polyester paint; dry film thickness of 0.35 mils, off-white to light gray in color.

2.3 FRAMING AND SUBSTRATES

- A. Secondary Framing: See Section 055000 "Metal Fabrications".
- B. Sheathing: See Section 061600 "Sheathing".
- C. Weather Barrier: See Section 072500 "Weather Barriers".

2.4 ACCESSORIES

- A. Trims and Flashings: Material, metal thickness, and finish to match panels. Profiles indicated in Drawings.
- B. Panel Penetration Flashings: As recommended by panel manufacturer.
- C. Fasteners: Per manufacturer recommendation.
- D. Profile Closures: Polyethylene foam, die-cut or formed to panel configuration.
- E. Sealant for Field Application: See Section 07 92 00 "Joint Sealants".
- F. Insulation: See Section 07 21 00 "Thermal Insulation".
- G. Acoustic Insulation: See Section 09 81 00 "Acoustic Insulation".

2.5 FABRICATION

- A. Fabrication, General:
 - 1. Unless otherwise shown on Drawings or specified herein, fabricate panels in continuous lengths and fabricate flashings and accessories in longest practical lengths.
 - 2. Panels shall be factory correctively-leveled.
- B. Fabrication Tolerances:
 - 1. Flat metal surfaces will display waviness commonly referred to as "oil canning". This is caused by steel mill tolerances and is a characteristic, not a defect, of panels manufactured from light gauge metal. Panels are factory correctively-leveled to minimize the occurrence of "oil canning". As such, "oil canning" will not be accepted as cause for rejection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: With Installer present.
 - 1. Examine conditions and substrates on which metal panels are to be installed. Structural support or substrate shall be flat and plumb to avoid panel stresses and distortion.
 - 2. Prior to starting work, correct defects.
- B. Field Measurements:
 - 1. Coordinate field measurements and fabrication schedule with construction progress.

2. Field measure prior to fabrication. Show recorded dimensions on shop drawings, including locations of shop-fabricated openings.
 3. If field measurements differ from drawing dimensions, notify Architect prior to fabrication.
- C. Framing & Substrate Tolerances: Deviations from flat plane shall not exceed the following.
1. 1/8 inch in 20 feet vertically or horizontally.
 2. 1/4 inch across building elevation.
 3. 1/16 inch in 5 feet.

3.2 PREPARATION

- A. Protection:
1. Treat contacting surfaces of dissimilar materials to prevent electrolytic corrosion.
 2. Where panels or trim may come in contact with dissimilar materials or treated lumber, fabricate transitions to facilitate drainage and minimize possibility of galvanic corrosion.
 3. At points of contact with dissimilar metal or treated lumber, coat panel or trim with protective paint or separate materials with a weatherproof underlayment.
 4. Direct contact or run-off from CCA, ACQ, AC, or other treated lumber (outdoor wood) or fire retardant impregnated or treated wood shakes or siding can cause panels and trim to fail prematurely. Avoid contact with these materials.

3.3 INSTALLATION

- A. Secondary Framing: Install according to approved shop drawings and metal panel manufacturer's recommendations.
- B. Panels and Flashing:
1. Install according to approved shop drawings.
 2. Comply with methods and recommendations of SMACNA Architectural Sheet Metal Manual for flashing configurations required.
 3. Overlap flashing at least 6 inches.
 4. Discrepancies between job site conditions and shop drawings shall be brought to the attention of the Architect for resolution.
 5. Cutting and Fitting:
 - a. Cut panels neat, square, and true with shearing action cutters. Torch or power saw cutting is prohibited.
 - b. Openings 6 inches and larger: Shop fabricate and reinforce to maintain original load capacity.
 - c. Openings less than 6 inches: Field cutting is acceptable.
- C. Accessories: Install trims, panel closures, flashings according to Drawings and manufacturer's recommended details.
- D. Sealant Installation: Apply according to approved shop drawings and SMACNA Architectural Sheet Metal Manual recommendations.
- E. Installation Tolerances: **Match dimensional tolerances of framing or substrate.**

3.4 CLEANING

- A. Repairs:
1. Touch up paint is not required for panels with scratches that do not expose metal.

2. Panels or flashings with finish damage exposing metal or with substrate damage shall be replaced.
- B. Cleaning and Waste Management: See Division 01 Section "Construction Waste Management and Disposal" for recycling requirements. At completion of each day's work and at work completion, sweep panels, flashings, and gutters clean. Do not allow fasteners, cuttings, filings, or scraps to accumulate.

END OF SECTION

SECTION 078413 - PENETRATION FIRESTOPPING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes: Penetration firestopping systems.

1.2 ACTION SUBMITTALS

- A. Product Data: Penetration firestopping systems.
- B. Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
- C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly developed in accordance with current International Firestop Council (IFC) guidelines. Obtain approval of authorities having jurisdiction prior to submittal.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Listed System Designs: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

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

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain penetration firestop systems for each type of opening indicated from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test in accordance with testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestop systems installed with products bearing the classification marking of a qualified product certification agency in accordance with listed system designs published by a qualified testing agency.
 - 1) UL in its online directory "Product iQ."
 - 2) Intertek Group in its "Directory of Building Products."

2.3 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems are to be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hilti, Inc.; or comparable products by one of the following:
 - a. 3M Building and Construction.
 - b. A/D Fire Protection Systems Inc.
 - c. Specified Technologies, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined in accordance with ASTM E814 or UL 1479.
 1. F-Rating: Not less than the fire-resistance rating of the wall penetrated.
 2. Membrane Penetrations: Install recessed fixtures such that the required fire resistance will not be reduced.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined in accordance with ASTM E814 or UL 1479.
 1. F-Rating: At least one hour, but not less than the fire-resistance rating of the floor penetrated.
 2. T-Rating: At least one hour, but not less than the fire-resistance rating of the floor. The following floor penetrations do not require a T-rating:
 - a. Those within the cavity of a wall.
 - b. Floor, tub, or shower drains within a concealed space.
 - c. 4-inch or smaller metal conduit penetrating directly into metal-enclosed electrical switchgear.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined in accordance with UL 1479.
 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, in accordance with ASTM E84.
 1. Verify sealant has a VOC content of 250 g/L or less.
 2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
 1. Permanent forming/damming/backing materials.
 2. Substrate primers.

3. Collars.
4. Steel sleeves.

2.4 FILL MATERIALS

- A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- D. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- E. Intumescent Wrap Strips: Single-component intumescent elastomeric strips for use around combustible penetrants.
- F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- G. Pillows/Bags: Compressible, removable, and reusable intumescent pillows encased in fire-retardant polyester or glass-fiber cloth. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.
- J. Fire-Rated Cable Sleeve Kits: Complete kits designed for new or existing cable penetrations through walls to accept standard accessories.
- K. Thermal Wrap: Flexible protective wrap tested and listed for up to 2-hour fire ratings in accordance with ASTM E814 or UL 1479 for membrane penetrations or ASTM E1725 or UL 1724 for thermal barrier and circuit integrity protection.
- L. Fire-Rated Cable Pathways: Single or gangable device modules composed of a steel raceway with integral intumescent material and requiring no additional action in the form of plugs, twisting closure, putty, pillows, sealant, or otherwise to achieve fire and air-leakage ratings.
- M. Retrofit Device for Cable Bundles: Factory-made, intumescent, collar-like device for firestopping existing over-filled cable sleeves and capable of being installed around projecting sleeves and cable bundles.

- N. Wall-Opening Protective Materials: Intumescent, non-curing putty pads or self-adhesive inserts for protection of electrical switch and receptacle boxes.
- O. Fire-Rated HVAC Retaining Angles: Steel angle system with integral intumescent firestop gasket for use around rectangular steel HVAC ducts without fire dampers.
- P. Firestop Plugs: Flexible, re-enterable, intumescent, foam-rubber plug for use in blank round openings and cable sleeves.
- Q. Fire-Rated Cable Grommet: Molded two-piece grommet made of plenum-grade polymer and foam inner core for sealing small cable penetrations in gypsum walls up to 1/2 inch in diameter.
- R. Endothermic Wrap: Flexible, insulating, fire-resistant, endothermic wrap for protecting membrane penetrations of utility boxes, critical electrical circuits, communications lines, and fuel lines.

2.5 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.

- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION OF PENETRATION FIRESTOPPING SYSTEMS

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

3.5 FIELD QUALITY CONTROL

- A. Owner may engage a qualified testing agency to perform tests and inspections according to ASTM E2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 8413

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SECTION 079200 – 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. Non-staining silicone joint sealants.
 - 2. Mildew-resistant joint sealants.
 - 3. Latex joint sealants.
 - 4. Latex acoustical joint sealants.
 - 5. Joint sealant backing.

- B. Related Sections:

- 1. Section 015719 "Interior Air Quality (IAQ) Management."
 - 2. Section 093100 "Ceramic Tiling" for tile and grout materials.
 - 3. Section 32313 "Site Concrete" for sealing joints in paved walkways and curbing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.

- B. Environmental Submittals: Per California Green Building Standards Code California Code of Regulations, Title 24, Part 11 (CALGreen).

- 1. Product Data: For sealants used inside the weatherproofing system, indicating VOC content of each product used in g/L.

- C. 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.

- 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- B. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

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.

1.7 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: Five years from date of Substantial Completion.

- 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.
- B. VOC Content: Sealants and sealant primers shall comply with the following:
1. Architectural sealants shall have a VOC content of 250 g/L or less.
 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
 3. Sealants and sealant primers for porous substrates shall have a VOC content of 775 g/L or less.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 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.

2.3 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
- B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. May National Associates, Inc.; a subsidiary of Sika Corporation.

- b. Pecora Corporation.
 - c. Sika Corporation; Joint Sealants.
 - d. Tremco Incorporated.
 - e. Laticrete International, Inc.
- C. Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation.
- D. Color-Matched Silicone, Nonstaining, S, NS, 25, T, NT: Nonstaining, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Laticrete International, Inc.; Latasil sealant, or approved equal. Sealant must be compatible with tile and grout materials specified in Section 093100 "Ceramic Tiling."

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.
- 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - d. Soudal USA.
 - e. Tremco Incorporated.

2.5 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - b. Pecora Corporation.
 - c. Sherwin-Williams Company (The).
 - d. Tremco Incorporated.

2.6 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Accumetric LLC.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. Grabber Construction Products.
 - d. Hilti, Inc.
 - e. OSI Sealants; Henkel Corporation.
 - f. Pecora Corporation.
 - g. Tremco Incorporated.
 - h. United States Gypsum Company.

2.7 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.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Alcot Plastics Ltd.
 - b. BASF Corporation; Construction Systems.
 - c. Construction Foam Products; a division of Nomaco, Inc.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application

indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

- 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.

2.8 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.
- 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.

3.4 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 and Walls with Sound Batt Insulation: 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. Airtight Execution:
1. Partition Bases and Heads: Provide ¼-inch (high) continuous bead of acoustical sealant at all locations where gypsum board meets structural flooring. The depth of the sealant shall equal the thickness of the gypsum layer or layers.
 2. Partition or Ceiling Joints at Dissimilar Materials: Provide ¼-inch continuous bead of acoustical sealant at all locations where gypsum board meets dissimilar material. The depth of the sealant shall equal the thickness of the gypsum layer or layers.
 3. Partition/Partition or Partition/Ceiling Joints: Provide standard corner taping detail.
 4. Pipe, Duct, Conduit, or Structural Penetrations: Provide ¼-inch wide bead of acoustical sealant around perimeter of each penetrating element. The depth of the sealant shall equal the thickness of the gypsum layer or layers.
 5. Electrical Boxes 4 by 4 inches or Less: Provide ¼-inch wide bead of acoustical sealant around perimeters of electrical boxes. The depth of the sealant shall equal the thickness of the gypsum layer or layers. Provide sheet caulking (e.g. Lowry Pads) continuous around the back side of boxes.
 6. Electrical, Lighting, or Other Recessed Boxes Over 4 by 4 inches: Provide one layer of 5/8-inch gypsum board continuous around the back of such boxes. Caulk or tape all joints and caulk all conduit penetrations with acoustical sealant.

3.5 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.

3.6 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.

3.7 JOINT-SEALANT SCHEDULE (Note: Not all sealants may be used this project.)

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces (JS-1).
 - 1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
 - c. Control and expansion joints in ceilings and other overhead surfaces.
 - d. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, nonstaining, S, NS, 100/50, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces (JS-2).
 - 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, nonstaining, S, NS, 100/50, T, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
 - 4. Joint-Sealant Backing: Preformed foam.

- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal traffic surfaces (JS-3).
1. Joint Locations:
 - a. Movement joints in tile walls and floors.
 - b. Perimeter joints between tile materials and metal trim accessories.
 2. Joint Sealant: Silicone, nonstaining, S, NS, 25, T, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
 4. Joint-Sealant Backing: Preformed foam.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces (JS-4).
1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Acrylic latex.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces (JS-5).
1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Metal thresholds.
 - c. Sill plates.
 - d. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Acoustical-Sealant Application: Interior vertical surfaces and horizontal nontraffic surfaces (JS-6).
1. Joint Locations: As indicated on Drawings.
 2. Joint Sealant: Latex, nonstaining, nonsag, paintable, acoustical.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081113 - 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. Standard steel doors and frames.
 - 2. Fixed transom panels.

- B. Related Requirements:

- 1. Section 057500 "Decorative Formed Metal" for aluminum brake metal to be installed in conjunction with hollow metal door frames.
 - 2. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.
 - 3. Section 088000 "Glazing" for insulated glazing.
 - 4. Section 092400 "Cement Plastering" for prefabricated aluminum stucco reglets / drip caps to be installed in conjunction with hollow metal door frames.
 - 5. Section 099100 "Painting" for field finishing of hollow metal 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.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions and finishes.
- B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.

- C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide hollow metal doors and frames by Steelcraft; an Allegion brand, or one of the following:
1. Ceco Door; ASSA ABLOY.
 2. Kewanee Corporation (The).
 3. Windsor Republic Doors.

2.2 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; SDI A250.4, Level A.
1. Doors:

- a. Type: As indicated in the Door and Frame Schedule.
- b. Thickness: 1-3/4 inches.
- c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
- d. Edge Construction: Model 2, Seamless.
- e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
- f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
- g. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
- h. Core: Vertical steel stiffener.

2. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch with minimum A60 coating.
- b. Construction: Full profile welded.

3. Exposed Finish: Prime.

2.3 BORROWED LITES

- A. Fabricate of metallic-coated steel sheet, minimum thickness of 0.053 inch.
- B. Construction: Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.4 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. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.

2. 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.
 3. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type 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. 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.
- G. Glazing: Comply with requirements in Section 088000 "Glazing."

2.7 FABRICATION

- A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness 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. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

3. 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. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule on Drawings, and templates.
 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
 1. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
 3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
- D. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 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. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with ANSI/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 without damage to completed Work.
 - a. Install frames with removable stops located on secure side of opening.
 - 2. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 4. 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 and adjust hollow-metal doors accurately in frames, within clearances specified below.
 - 1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.

3.3 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 085113 - ALUMINUM WINDOWS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Aluminum windows.

B. Related Requirements:

1. Section 076200 "Sheet Metal Flashing and Trim" for sill pans.
2. Section 079000 "Joint Sealants" for sealing around the interior and exterior of aluminum window assemblies.
3. Section 088000 "Glazing."
4. Section 092400 "Cement Plastering" for prefabricated aluminum stucco reglets / drip caps to be installed in conjunction with aluminum windows.

1.2 PREINSTALLATION MEETINGS**A. Preinstallation Conference: Conduct conference at Project site**

1. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
2. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
3. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.3 ACTION SUBMITTALS**A. Product Data: For each type of product.**

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.

B. Shop Drawings: For aluminum windows.

1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples for Verification: For each exposed product and for each color specified, 2 by 4 inches in size.**D. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.**

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- C. Sample Warranties: For manufacturer's warranties.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
- B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver aluminum windows to Project site in original, unopened packages and store them in accordance with manufacturer's written instructions. Protect aluminum windows against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Handle aluminum windows in a manner that prevents damage before, during, and after installation.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install aluminum windows outside of limits recommended in writing by manufacturer.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

- a. Failure to meet performance requirements.
- b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
- c. Faulty operation of movable sash and hardware.
- d. Deterioration of materials and finishes beyond normal weathering.
- e. Failure of insulating glass.

2. Warranty Period:

- a. Window: Two years from date of Substantial Completion.
- b. Glazing Units: 10 years from date of Substantial Completion.
- c. Hardware: Three years from date of Substantial Completion.
- d. Aluminum Finish: 10 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: AAMA 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: AW.
 - 2. Minimum Performance Grade: 40.
 - 3. Muller Window Systems: Evaluate and rate combination assemblies as single systems as determined by AAMA 450 in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 requirements.
- C. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:
 - 1. Thermal Transmittance (U-Factor): As determined in accordance with NFRC 100.
 - a. Fixed Windows: Not more than **0.36** Btu/sq. ft. x h x deg F.
 - b. Operable Windows: Not more than **0.46** Btu/sq. ft. x h x deg F.
 - 2. Solar Heat-Gain Coefficient (SHGC): As determined in accordance with NFRC 200.
 - a. Fixed Windows: Not more than **0.22**.
 - b. Operable Windows: Not more than **0.25** as determined in accordance with NFRC 200.
 - 3. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance in accordance with AAMA 1503, showing a CRF of 45.
- D. 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.

2.3 ALUMINUM WINDOWS

- A. Basis-of-Design: Subject to compliance with requirements, provide Arcadia Inc., T325 Series (Thermal) Heavy Commercial Windows, 3-1/4-inch depth, or approved equal:
- B. Provide manufacturer's standard aluminum window assemblies consisting of frames, sashes, glass, hardware, fasteners, and all components and accessories as required for a complete installation.

- C. Operating Types: Provide the following operating types in locations indicated on Drawings:
1. Projected, awning.
 2. Fixed.
- D. 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.
- E. Insulating-Glass Units: ASTM E2190 as specified in Section 088000 "Glazing."
1. Glass: ASTM C1036, Type 1, Class 1, q3.
 - a. Tint: Clear.
 - b. Kind: Fully tempered.
 2. Lites: Two.
 3. Filling: Fill space between glass lites with air.
 4. Low-E Coating: Pyrolytic or sputtered on second surface.
- F. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
1. Exposed Hardware Color and Finish: As indicated by manufacturer's designations.
- G. Window Hardware: Projected.
1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested in accordance with ASTM E405, Method A. Provide operators that function without requiring the removal of interior screens.
 - a. Operation:
 2. Hinges: Non-friction type, not less than two per sash.
 3. Lock: Manufacturer's standard cam-action lock with keeper.
 4. Limit Devices: Concealed friction adjuster, adjustable stay bar or concealed support arms with adjustable, limited, hold-open limit devices designed to restrict sash opening.
- H. Limit clear opening to 4 inches for ventilation; with custodial key release.
- I. Weather Stripping: Provide manufacturer's standard full-perimeter weather stripping for each operable sash unless otherwise indicated.
- J. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
1. Exposed Fasteners: Avoid exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

- K. Mullions: Provide manufacturer's standard combination and reinforcing mullions and cover plates matching window units, complete with anchors for support to structure. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide reinforcing mullions and cover plates capable of withstanding design wind loads of window units.

2.4 ACCESSORIES

- A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.

2.5 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

- 1. Type and Location: Full, inside for projected, awning sashes.

- B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

- 1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.

- C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch- diameter, coated aluminum wire.

- 1. Wire-Fabric Finish: Charcoal gray.

2.6 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. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- D. Complete fabrication, assembly, finishing and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

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

PART 3 - EXECUTION

3.1 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, 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 E2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Mullions: Install combination and reinforcing mullions for combination assemblies in accordance with manufacturer's written instructions.
- D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- E. 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. 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.

- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- C. 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 085113

SECTION 087100 DOOR HARDWARE**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Door hardware.
2. Cylinders for doors fabricated with locking hardware.

B. Related Divisions:

1. Division 07 – Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
2. Division 08 – metal doors and frames.

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows.
2. Cabinets, including open wall shelving and locks.
3. Signs.
4. Toilet accessories, including grab bars.
5. Installation.
6. Rough hardware.
7. Access doors and panels.

1.2 REFERENCES:**A. Use date of standard in effect as of Bid date.**

1. American National Standards Institute
 - a) ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties.
2. BHMA – Builders Hardware Manufacturers Association
3. 2022 California Building Code.
 - a) Chapter 11B – Accessibility To Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
4. DHI – Door and Hardware Institute.
5. UL – Underwriters Laboratories
 - a) UL 305 – Panic Hardware
6. WHI – Warnock Hersey Incorporated State of California Building Code
7. Local applicable codes
8. SDI – Steel Door Institute
9. NAAMM – National Association of Architectural Metal Manufacturers

B. Abbreviations

1. Manufacturers: see table at 2.1.A of this section.
2. Finishes: see 2.7 of this section.

1.3 SUBMITTALS & SUBSTITUTIONS

- A. SUBMITTALS: Submit electronic copy of schedule. Organize vertically formatted schedule into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Minimum 10pt font size. Include following information:
1. Type, style, function, size, quantity and finish of hardware items.
 2. Use BHMA Finish codes per ANSI A156.18.
 3. Name, part number and manufacturer of each item.
 4. Fastenings and other pertinent information.
 5. Location of hardware set coordinated with floor plans and door schedule.
 6. Explanation of abbreviations, symbols, and codes contained in schedule.
 7. Mounting locations for hardware.
 8. Door and frame sizes, materials and degrees of swing.
 9. List of manufacturers used and their nearest representative with address and phone number.
 10. Catalog cuts.
- B. Bid and submit manufacturer's updated/improved item if scheduled item is discontinued.
- C. Deviations: Highlight, encircle or otherwise identify deviations from "Schedule of Finish Hardware" on submittal with notations clearly designating those portions as deviating from this section.
- D. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.
- E. Substitutions per Division 1. Include product data and indicate benefit to the Project. Furnish operating samples on request.
- F. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.
- G. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, riser and point-to-point wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.4 QUALITY ASSURANCE:

- A. Qualifications:
1. Hardware supplier: direct factory contract supplier who employs a hardware consultant, available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.
 - a) Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.
- B. Hardware: Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.
- C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.
- D. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions and code requirements.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Delivery: coordinate delivery to appropriate locations (shop or field).
 - 1. Permanent keys and cores: secured delivery direct to Owner's representative.
- B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.
- C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.6 PROJECT CONDITIONS AND COORDINATION:

- A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.
- B. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information:
 - 1. Location of embedded and attached items to concrete.
 - 2. Location of wall-mounted hardware, including wall stops. Note: Careful coordination required for reinforcement/blocking for wall stop support. If random inspection yields an unsupported wall stop, all locations will be rebuilt at no expense to the Owner or Architect.
 - 3. Location of finish floor materials and floor-mounted hardware.
 - 4. At masonry construction, coordinate with the anchoring and hollow metal supplier prior to frame installation by placing a strip of insulation, wood, or foam, on the back of the hollow metal frame behind the rabbet section for continuous hinges, as well as at rim panic hardware strike locations, silencers, coordinators, and door closer arm locations. When the frame is grouted in place, the backing will allow drilling and tapping without dulling or breaking the installer's bits.
 - 5. Coordinate: flush top rails of doors at out swinging exteriors, and throughout where adhesive-mounted seals occur.
 - 6. Manufacturers' templates to door and frame fabricators.
- C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.
- D. Environmental considerations: segregate unused recyclable paper and paper product packaging, uninstalled metals, and plastics, and have these sent to a recycling center.

1.7 WARRANTY:

- A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties.
- B. Include factory order numbers with close-out documents to validate warranty information, required for Owner in making future warranty claims:
- C. Minimum warranties:

1.	Locksets:	Ten years
2.	Extra Heavy-Duty Cylindrical Lock:	Ten years mechanical
3.	Exit Devices:	Ten years mechanical
4.	Closers:	Thirty years mechanical
5.	Hinges:	One year
6.	Continuous Hinges	Lifetime
7.	Other Hardware	Two years

1.8 COMMISSIONING:

- A. Conduct these tests prior to request for certificate of substantial completion:
1. With installer present, test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.

1.9 REGULATORY REQUIREMENTS:

- A. Locate latching hardware between 34 inches to 44 inches above the finished floor, per 2022 California Building Code, Section 11B-404.2.7.
1. Panic hardware: locate between 36 inches to 44 inches above the finished floor.
- B. Handles, pull, latches, locks, other operable parts:
1. Readily openable from egress side with one hand and without tight grasping, tight pinching, or twisting of the wrist to operate. 2022 California Building Code Section 11B-309.4.
 2. Force required to activate the operable parts: 5.0 pounds maximum, per 2022 California Building Code Section 11B-309.4.
- C. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2022 California Building Code Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.
1. Exception: exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leafs or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.
- D. Adjust door closer sweep periods so that from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch, measured to the landing side of the door, per 2022 California Building Code Section 11B-404.2.8.
- E. Smooth surfaces at bottom 10 inches of push sides of doors, facilitating push-open with wheelchair footrests, per 2022 California Building Code Section 11B-404.2.10.
1. Applied kickplates and armor plates: bevel the left and right edges; free of sharp or abrasive edges. Cavities created by kickplates to be capped per 2022 California Building Code Section 11B-404.2.10.
 2. Tempered glass doors without stiles: bottom rail may be less than 10 inches if top leading edge is tapered 60 degrees minimum.

- F. Door opening clear width no less than 32 inches, measured from face of frame stop, or edge of inactive leaf of pair of doors, to door face with door opened to 90 degrees. Hardware projection not a factor in clear width if located above 30 inches and below 80 inches, and the hardware projects no more than 4 inches. 2022 California Building Code Section 11B-404.2.3.
 - 1. Exception: In alterations, a projection of 5/8 inch (15.9 mm) maximum into the required clear width shall be permitted for the latch side stop.
 - 2. Door closers and overhead stops: not less than 78 inches above the finished floor or ground, per 2022 California Building Code 11B-307.4.
- G. Thresholds: floor or landing no more than 0.50 inches below the top of the threshold of the doorway, per 2022 California Building Code Section 11B-404.2.5. Vertical rise no more than 0.25 inches, change in level between 0.25 inches and 0.50 inches: beveled to slope no greater than 1:2 (50 percent slope). 2022 California Building Code Section 11B-303.2 & ~.3.
- H. Floor stops: Do not locate in path of travel. Locate no more than 4 inches from walls, per DSA Policy #99-08 (Access).
- I. Pairs of doors with independently-activated hardware both leafs: limit swing of right-hand or right-hand-reverse leaf to 90 degrees to protect persons reading wall-mounted tactile signage, per 2022 California Building Code Section 11B-703.4.2.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

- A. Listed acceptable alternate manufacturers: these will be considered; submit for review products with equivalent function and features of scheduled products.

ITEM:	MANUFACTURER:	ACCEPTABLE ALTERNATE:
Hinges	(IVE) Ives	Bommer
Continuous Hinges	(IVE) Ives	Select
Key System	(SCH) Schlage	Owner standard
Mechanical Locks	(SCH) Schlage	Owner standard
Exit Devices	(VON) Von Duprin	Owner standard
Closers	(LCN) LCN	Owner standard
Push & Pull Plates	(IVE) Ives	Rockwood, Trimco
Kickplates	(IVE) Ives	Rockwood, Trimco
Stops & Holders	(IVE) Ives	Rockwood, Trimco
Thresholds	(ZER) Zero	NGP, Pemko
Seals & Bottoms	(ZER) Zero	NGP, Pemko

2.2 HINGING METHODS:

- A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.
- B. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.
- C. Conventional Hinges: Steel or stainless-steel pins and approved bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.
1. Out-swinging exterior doors: non-ferrous with non-removable (NRP) pins and security studs.
 2. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.
- D. Continuous Hinges:
1. Geared-type aluminum.

- a) Use wide-throw units where needed for maximum degree of swing, advise architect if commonly available hinges are insufficient.
- b) If units are used at storefront openings, color-coordinate hinge finish with storefront color. Custom anodizing and custom powdercoat finishes subject to Architect approval.

2.3 LOCKSETS, LATCHSETS, DEADBOLTS:

A. Mortise Locksets and Latchsets: as scheduled.

1. Chassis: cold-rolled steel, handing field-changeable without disassembly.
2. Universal lock case – 10 functions in one case.
3. Floating mounting tabs automatically adjusts to fit a beveled door edge.
4. Latchbolts: 0.75 inch throw stainless steel anti-friction type.
5. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.
 - a) Spindles: security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.
 - b) Inside lever applied by screwless shank mounting – no exposed trim mount screws.
 - c) Levers rotate up or down for ease of use.
6. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
7. Turnpieces: accessible offset turn-lever design not requiring pinching or twisting motions to operate.
8. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
9. Scheduled Lock Series and Design: Schlage L series, 06N design.
10. Certifications:
 - a) ANSI A156.13, 1994, Grade 1 Operational.
 - b) ANSI/ASTM F476-84 Grade 31 UL Listed.
11. Accessibility: Require not more than 5 lb to retract the latchbolt or deadbolt, or both, per CBC 2022 11B-404.2.7 and 11B-309.4.
12. Accepted substitutions: None.

2.4 EXIT DEVICES / PANIC HARDWARE

A. General features:

1. Independent lab-tested 1,000,000 cycles.
2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
3. Deadlocking latchbolts, 0.75 inch projection.
4. End caps: impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
5. No exposed screws to show through glass doors.
6. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.

7. Accessibility: Require not more than 5 lb to retract the latchbolt, per CBC 2022 11B-404.2.7 and 11B-309.4.
 - a) Mechanical method: Von Duprin "AX-" feature, where touchpad directly retracts the latchbolt with 5 lb or less of force. Provide testing lab certification confirming that the mechanical device is independent third-party tested to meet this 5 lb requirement.

B. Specific features:

1. Non-Fire Rated Devices: cylinder dogging with security indicator.
2. Lever Trim: breakaway type, forged brass or bronze escutcheon min. 0.130 inch thickness, compression spring drive, match lockset lever design.
3. 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.
4. Accepted substitutions: None.

2.5 CLOSERS

A. Surface Closers: 4040XP

1. Full rack-and-pinion type cylinder with removable non-ferrous 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. Independent lab-tested 10,000,000 cycles.
4. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
6. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2022 California Building Code Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.
 - a) Exception: exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leaves or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.
7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
9. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
10. Exterior doors: seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.
11. Non-flaming fluid, will not fuel door or floor covering fires.
12. Pressure Relief Valves (PRV) not permitted.
13. Accepted substitutions: None.

2.6 OTHER HARDWARE

- A. Kick Plates: Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.
- B. Door Stops: Provide stops to protect walls, casework or other hardware.

1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where floor type cannot be used, provide wall type. If neither can be used, provide overhead type.
- C. Seals: Four-fingered type at head & jambs. Inelastic, rigid back, not subject to stretching. Self-compensating for warp, thermal bow, door settling, and out-of-plumb. Adhesive warranted for life of installation.
 1. Proposed substitutions: submit for approval.
 2. Three-fingered type at hinge jambs of doors fitted with continuous hinges where jamb leaf of hinge is fastened to the frame reveal.
- D. Thresholds: As scheduled and per details. Comply with CBC 2022 11B-404.2.5. Substitute products: certify that the products equal or exceed specified material's thickness. Proposed substitutions: submit for approval.
 1. Saddle thresholds: 0.125 inches minimum thickness.
 2. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Minimum 0.25 inch diameter fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors. National Guard Products' "COMBO" or Pemko Manufacturing's "FHSL".
 3. Fire-rated openings, 90-minutes or less duration: use thresholds to interrupt floor covering material under the door where that material has a critical radiant flux value less than 0.22 watts per square centimeter, per NFPA 253. Use threshold unit as scheduled. If none scheduled, include a 0.25in high 5in wide saddle in the bid, and request direction from Architect.
 4. Fire-rated openings, 3-hour duration: Thresholds, where scheduled, to extend full jamb depth.
 5. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.
 6. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.
- E. Through-bolts: Do not use. Coordinate with wood doors; ensure provision of proper blocking to support wood screws for mounting panic hardware and door closers. Coordinate with metal doors and frames; ensure provision of proper reinforcement to support machine screws for mounting panic hardware and door closers.
 1. Exception: surface-mounted overhead stops, holders, and friction stays.

2.7 FINISH:

- A. Generally: BHMA 626 Satin Chromium.
 1. Areas using BHMA 626: furnish push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise scheduled.
- B. Door closers: factory powder coated to match other hardware, unless otherwise noted.

2.8 KEYING REQUIREMENTS:

- A. Key System: (Verify with Owner) Schlage Everest GP Primus 29 high-security utility-patented keyway, interchangeable core throughout. Utility patent protection to extend at least until 2029. Key blanks available only from factory-direct sources, not available from after-market keyblank manufacturers. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner and Allegion representatives to determine system keyway(s), keybow styles, structure, stamping, degree of physical security and degree of geographic exclusivity. Furnish Owner's written approval of the system; do not order keys or cylinders without written confirmation of actual requirements from the Owner. Contractor will install permanent cylinders/cores.
 - 1. Existing factory-registered master key system.
 - 2. Primus Level 3 (verify with Owner)
 - 3. Construction keying: furnish temporary keyed-alike cores. Remove at substantial completion and install permanent cylinders/cores in Owner's presence. Demonstrate that construction key no longer operates.
 - 4. Temporary cylinders/cores remain supplier's property.
 - 5. Furnish 10 construction keys.
 - 6. Furnish 2 construction control keys.
 - 7. Furnish 2 Emergency keys per each L9485 Faculty Restroom Lock
 - 8. Key Cylinders: furnish 6-pin solid brass construction.
- B. Cylinders/cores: keyed at factory of lock manufacturer where permanent records are maintained. Locksets and cylinders same manufacturer.
- C. Permanent keys: use secured shipment direct from point of origination to Owner.
 - 1. For estimate: 3 keys per change combination, 5 master keys per group, 5 grand-master keys, 3 control keys.
 - 2. For estimate: VKC stamping plus "DO NOT DUPLICATE".
- D. Bitting List: use secured shipment direct from point of origination to Owner at completion.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS:

- A. Can read and understand manufacturers' templates, suppliers' hardware schedule and printed installation instructions. Can readily distinguish drywall screws from manufacturers' furnished fasteners. Available to meet with manufacturers' representatives and related trades to discuss installation of hardware.

3.2 PREPARATION:

- A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation. Installation denotes acceptance of wall/frame condition.
- A. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.
 - 1. Notify Architect of code conflicts before ordering material.
 - 1. Locate latching hardware between 34 inches to 44 inches above the finished floor, per California Building Code, Section 1008.1.9.2 and

11B-404.2.7.

2. Locate panic hardware between 36 inches to 44 inches above the finished floor.

3.3 INSTALLATION

- A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.
 1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
 2. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
 3. Replace fasteners damaged by power-driven tools.
- B. Locate floor stops no more than 4 inches from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.

3.4. ADJUSTING

- A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.
 1. Hardware damaged by improper installation or adjustment methods: repair or replace to Owner's satisfaction.
 2. Adjust doors to fully latch with no more than 1 pound of pressure.
 - a) Door closer valves: turn valves clockwise until at bottom – do not force. Turn valves back out one and one-half turns and begin adjustment process from that point. Do not force valves beyond three full turns counterclockwise.
 3. Adjust door closers per 1.9 this section.
- B. Final inspection: Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following:
 1. Has re-adjusted hardware.
 2. Has evaluated maintenance procedures and recommend changes or additions and instructed Owner's personnel.
 3. Has identified items that have deteriorated or failed.
 4. Has submitted written report identifying problems.

3.5 DEMONSTRATION:

- A. Demonstrate mechanical hardware, including adjustment and maintenance procedures.

3.6 PROTECTION/CLEANING:

- A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.

- B. Clean adjacent wall, frame and door surfaces soiled from installation / reinstallation process.

3.7 SCHEDULE OF FINISH HARDWARE

- A. See door schedule in drawings for hardware set assignments.
- B. Do not order material until submittal has been reviewed, stamped, and signed by Architect's door hardware consultant.
- C. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

Opt. #: OPT0425884-V2

HARDWARE GROUP NO. 01

Provide each SGL door(s) with the following:

1	EA	CONT. HINGE	112XY		628	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-98-NL		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	MORTISE CYLINDER (DOGGING)	20-061 ICX XQ11-948 36-083		626	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 S		626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH ST-1595 SPEC		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA (OMIT @ OVERHANG)		AA	ZER
1	SET	GASKETING	429AA-S		AA	ZER
1	EA	DOOR SWEEP	8192AA		AA	ZER
1	EA	THRESHOLD	103A OR AS DETAILED OR PER SILL CONDITION		A	ZER

HARDWARE GROUP NO. 02

Provide each SGL door(s) with the following:

1	EA	CONT. HINGE	112XY		628	IVE
1	EA	CLASSROOM SECURITY	L9071T 06N		626	SCH
1	EA	LOCK GUARD	5000-T		626	TRI
2	EA	PRIMUS CORE	20-740-XP EV29 S		626	SCH
1	EA	SURFACE CLOSER	4040XP SHCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA (OMIT @ OVERHANG)		AA	ZER
1	SET	GASKETING	429AA-S		AA	ZER
1	EA	DOOR SWEEP	8192AA		AA	ZER
1	EA	THRESHOLD	103A OR AS DETAILED OR PER SILL CONDITION		A	ZER

HARDWARE GROUP NO. 03

Provide each SGL door(s) with the following:

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO		626	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 S		626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D		626	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

HARDWARE GROUP NO. 04

Provide each SGL door(s) with the following:

3	EA	HINGE	5BB1 SH 4.5 X 4.5 NRP		630	IVE
1	EA	STOREROOM LOCK	L9080T 06N		626	SCH
1	EA	LOCK GUARD	5000-T		626	TRI
1	EA	PRIMUS CORE	20-740-XP EV29 S		626	SCH
1	EA	SURFACE CLOSER	4040XP HEDA ST-1944 SPEC		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS18L/FS18S AS REQ'D		BLK	IVE
1	EA	RAIN DRIP	142AA (OMIT @ OVERHANG)		AA	ZER
1	SET	GASKETING	429AA-S		AA	ZER
1	EA	DOOR SWEEP	8192AA		AA	ZER
1	EA	THRESHOLD	103A OR AS DETAILED OR PER SILL CONDITION		A	ZER

HARDWARE GROUP NO. 05

Provide each SGL door(s) with the following:

3	EA	HINGE	5BB1 SH 4.5 X 4.5 NRP		630	IVE
1	EA	FACULTY RESTROOM/HOTEL	L9485T 06B L583-363		626	SCH
1	EA	FSIC CORE	30-120		626	SCH
1	EA	SURFACE CLOSER	4040XP EDA ST-1944 SPEC		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS18L/FS18S AS REQ'D		BLK	IVE
1	EA	RAIN DRIP	142AA (OMIT @ OVERHANG)		AA	ZER
1	SET	GASKETING	429AA-S		AA	ZER
1	EA	DOOR SWEEP	8192AA		AA	ZER
1	EA	THRESHOLD	103A OR AS DETAILED OR PER SILL CONDITION		A	ZER

END OF SECTION

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SECTION 088000 - GLAZING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Glass products.
2. Low-E insulated glass.
3. Glazing accessories.

B. Related Sections:

1. Section 015719 "Interior Air Quality (IAQ) Management."
2. Section 085113 "Aluminum Windows" for factory glazing.

1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.
- C. CBC: California Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.
- E. Sealed Insulating Glass Unit Surface Designations:
 1. Surface 1 - Exterior surface of the outer glass lite.
 2. Surface 2 - Interspace surface of the outer glass lite.
 3. Surface 3 - Interspace surface of the inner glass lite.
 4. Surface 4 - Interior surface of the inner glass lite.

1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Environmental Submittals: Reference Standard: California Green Building Standards Code California Code of Regulations, Title 24, Part 11 (CALGreen).
 1. All components used in installation of glazing to meet requirements of SCAQMD Rule#1168 and Green Seal Standard GC-36 for Adhesives and Sealants. Documentation is required.

- C. Glass Samples: For insulating glass, 12 inches square.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer of fabricated glass units.
- B. Product Test Reports: For insulating glass.
- C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced Installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of three years successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials in accordance with 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.

1.8 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.

1.9 WARRANTY

- A. 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 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. Source Limitations for Glass: Obtain glass from single source from single manufacturer.
- B. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:
 - 1. Design Wind Pressures: As indicated on Drawings.
 - 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
 - 3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- D. Thermal Movements: Provide glazing that allows for thermal movements resulting from ambient and surface temperatures changes acting on glass framing members and glazing components.
- E. 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 insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 - 2. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F.
 - 3. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program.
 - 4. Visible Reflectance: Center-of-glazing values, in accordance with 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. NGA Publications: "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 the IGCC.

- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.

- E. Strength: Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear), Quality-Q3.

- B. Reflective- and Low-E-Coated Vision Glass: ASTM C1376.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.

1. Provide Kind FT (fully tempered) glass lites where safety glass is indicated or required.
2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
3. Sealing System: Comply with requirements in Section 07920 - Joint Sealants. Dual seal, with primary and secondary sealants of polyisobutylene and silicone.
4. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
 - a. Spacer Material: Aluminum with mill or clear anodic finish.
 - b. Desiccant: Molecular sieve or silica gel, or blend of both.
 - c. Corner Construction: Manufacturer's standard corner construction.

2.6 GLAZING SEALANTS

- A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. All paints, coatings, sealants and adhesives to be field-applied, within the building envelope must comply with VOC limits in Section 015719 "Indoor Air Quality (IAQ) Management".
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of industry colors.

- B. Elastomeric Glazing Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements.

1. Base Polymer: Neutral-curing silicone.

2. Type: S, single component.
3. Grade: NS, nonsag.
4. Class: 25.
5. Use Related to Exposure: NT (nontraffic).
6. Use Related to Glazing Substrates: G, A, and O (including wood).

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by 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 and Edge Blocks: EPDM, silicone, neoprene or santoprene with a Shore A durometer hardness of 85, plus or minus 5 as recommended by sealant or glass manufacturer.
- D. Spacers: Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated as recommended by glass manufacturer.

2.8 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 2. Presence and functioning of weep systems.
 3. Minimum required face and edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch- minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

3.4 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 in writing 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 in writing by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

SECTION CONTINUES ON FOLLOWING PAGE

3.6 INSULATING GLASS SCHEDULE

A. Low-E-Clear Insulating Glass (Type GL3B): Clear, low-reflective exterior appearance.

1. Basis-of-Design Product: Vitro Architectural Glass; Double Glazed Tinted Solar Control Insulating Glass Unit Solarban 60 on Solexia 6mm (2) | Air 1/2" (12.7mm) | Clear 6mm
2. Conformance: ASTM E 2190.
3. Outdoor Lite: Solexia Tinted Float Glass as manufactured by Vitro Architectural Glass.
 - a. Conformance: ASTM C 1036, Type 1, Class 2 Quality q3
 - b. Glass Thickness: 6mm (1/4")
 - c. Magnetic Sputter Vacuum Deposition Coating (MSVD): ASTM C 1376
 - d. Coating: Solarban 60 on Surface 2
 - e. Heat Treatment: Heat strengthened, ASTM C 1048, Kind HS, Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 18CFR-1201
4. Interspace Content: Air 1/2"
5. Indoor Lite: Clear Float glass as manufactured by Vitro Architectural Glass
 - a. Conformance: ASTM C 1036, Type 1, Class 2 Quality q3
 - b. Glass Thickness: 6mm (1/4")
 - c. Heat Treatment: Heat strengthened, ASTM C 1048, Kind HS, Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 18CFR-1201
6. Overall Unit Thickness: 1 inch.
7. Performance Requirements:
 - a. Winter U-Value: 0.29.
 - b. Summer U-Value: 0.27
 - c. Solar Heat Gain Coefficient: 0.32.
 - d. Shading Coefficient: 0.37.
 - e. Visible Light Transmittance: 61 percent.
 - f. Outdoor Visible Light Reflectance: 9 percent.

END OF SECTION 088000

SECTION 092400 - 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. Metal lath.
2. Accessories.
3. Base-coat cement plaster.
4. Leveling and reinforcing coats.
5. Bonding agent and admixture.
6. Cement plaster finish coats.

B. Related Requirements:

1. Section 061600 "Sheathing."
2. Section 072500 "Weather Barriers."
3. Section 076200 "Sheet Metal Flashing and Trim."
4. Section 079200 "Joint Sealants."
5. Section 099100 "Painting" for field-applied finish paint products to be applied over ready-mixed finish-coat plaster.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachment details.
- C. Samples for Initial Selection: For each type of factory-prepared finish coat and for each color and texture specified.

1.5 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups for each substrate and finish texture indicated for cement plastering, including accessories.
 - a. Size: Minimum 100 sq. ft. in surface area.
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.

1.6 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.

1.7 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. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 - PRODUCTS

2.1 METAL LATH

- A. Expanded-Metal Lath: ASTM C 847, cold-rolled carbon-steel sheet with ASTM A 653/A 653M, G60, hot-dip galvanized-zinc coating.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:
 - a. CEMCO; California Expanded Metal Products Co.
 - b. ClarkDietrich Building Systems.
 - c. Phillips Manufacturing Co.

2. Flat Diamond-Mesh Lath: 3.4 lb/sq. yd.
3. Diamond-Mesh Lath: Self-furring, 3.4 lb/sq. yd.
4. 3/8-Inch Rib Lath: 3.4 lb/sq. yd.

2.2 ACCESSORIES

- A. General: Comply with ASTM C 1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Metal Accessories:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:
 - a. CEMCO; California Expanded Metal Products Co.
 - b. ClarkDietrich Building Systems.
 - c. Phillips Manufacturing Co.
 2. External- (Outside-) Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized-zinc coating.
- C. Aluminum Moldings
 1. General: Comply with ASTM C 1063, and coordinate depth of moldings with thicknesses and number of plaster coats required.
 2. Manufacturer:
 - a. Basis-of-Design: Subject to compliance with requirements, provide products by Fry Reglet Corporation, or approved equal.
 3. Foundation Weep Screed: Fry Reglet FSW-75A.
 - a. Material and Finish: Extruded aluminum, clear anodized
 4. Casing Bead: Fry Reglet JPM -75 Stucco J Molding:
 - a. Square-edged style; with flange.
 - b. Material: Extruded aluminum, clear anodized.
 5. Channel Screed / Control Joint: Fry Reglet DCS-50-75.
 - a. Square-edged style; with flange.
 - b. Material: Extruded aluminum, clear anodized.
 6. Ventilated "T" Reveal Molding: Fry Reglet TRM-75-V-150.
 - a. Description: Ventilated reveal transition between vertical and non-vertical cement plaster.
 - b. Material: Extruded aluminum., clear anodized.

7. Ventilated "F" Reveal Molding: Fry Reglet FPM-75-V-75.
 - a. Description: Ventilated reveal transition between cement plaster soffit and fiber cement fascia trim.
 - b. Material: Extruded aluminum, clear anodized
8. Non-ventilated "F" Reveal Molding: Fry Reglet FPM-75-50.
 - a. Description: Nonventilated reveal transition between vertical cement plaster and vertical fiber cement trim.
 - b. Material: Extruded aluminum, clear anodized.
9. Stucco Reglet: Fry Reglet "ST" Stucco Reglet and Fry Reglet "Springlok" Flashing
 - a. Description: Reglet and vertical flashing system
 - b. Material: Extruded aluminum, manufacturer's standard gray polyster coating.
10. Fabrication, General:
 - a. Mounting holes: Provide mounting holes located at 8" o. c.
 - b. Venting: Vent slots shall be 1-inch by 1/8-inch spaced at 1-1/2 inches lengthwise. Each row of vent slots shall provide 1 square inch of free area per lineal foot.
 - c. Make custom miters and intersections with welded corners or with high-strength industrial tape on backs.

2.3 CEMENT PLASTER MATERIALS

- A. General: Comply with requirements in ASTM C926 for applications indicated.
- B. Source Limitations: Obtain cement plaster materials from single source from single manufacturer.
- C. Basis-of-Design: Subject to compliance with requirements, provide Parex USA, Inc.; La Habra FastWall 300-K Krak-Shield, or approved equal.
- D. Base-Coat Mixes: Scratch and brown coats for three-coat plasterwork as follows:
 1. Basis-of-Design Product: LaHabra Fiber-47 Fastwall Scratch & Brown Concentrate.
 2. Factory blended portland cement, fibers, hydrated lime and proprietary ingredients, cement scratch and brown coat mixed in the field with sand.
 3. Portland Cement Mixes:
 - a. Scratch Coat: Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - b. Brown Coat: Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
- E. Leveling and Reinforcing Coat:

1. Stucco Level Coat: Copolymer based, factory blend of cement and proprietary ingredients requiring addition of water.
2. Parex USA 355 Standard Mesh: Weight 4.5 oz/sq yd reinforcing mesh.

F. Acrylic Bonder and Admixture:

1. LaHabra Acrylic Bonder & Admix: 100% acrylic admix emulsion for portland cement based products, to enhance curing, adhesion, freeze-thaw resistance and workability and/or as an acrylic polymer bonding agent for between a cementitious base and stucco finish coat.

G. Ready-Mixed Finish-Coat Plaster: Factory-mixed portland cement, aggregates, coloring agents, and proprietary ingredients.

1. Basis-of-Design: LaHabra Finish:
 - a. Exterior Stucco Color Coat: blend of portland cement, hydrated lime, aggregates and additives.
 - b. Santa Barbara Mission Finish: Smooth stucco finish coat.
 - c. Color: As selected by Architect from manufacturer's full range to match exterior paint color as indicated on Drawings. Note all exterior cement plaster to be painted in addition to having integral color finish coat.

2.4 MISCELLANEOUS MATERIALS

- A. Sand Aggregate: ASTM C 897.
- B. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- C. Fasteners for Attaching Metal Lath and Accessories to Substrates: Corrosion-resistant screws per ASTM C 1063.
- D. Fasteners for Reveal Moldings: Exposed fasteners shall be countersunk and shall match accessories in color.
 1. Aluminum to Aluminum: Aluminum or Type 302 or 304 stainless steel.
 2. Aluminum to Stainless Steel or Carbon Steel: Type 302 or 304 Stainless steel

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. Reject plaster materials that are wet or moisture damaged.
- C. 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 INSTALLING METAL LATH

- A. Metal Lath: Install according to ASTM C 1063.
 - 1. Partition Framing and Vertical Furring: Install flat-diamond-mesh lath.
 - 2. Flat-Ceiling and Horizontal Framing: Install 3/8-inch rib lath.
 - 3. On Solid Surfaces, Not Otherwise Furred: Install self-furring, diamond-mesh lath.

3.4 INSTALLING ACCESSORIES AND REVEALS

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
- B. Reinforcement for External (Outside) Corners:
 - 1. Install lath-type, external-corner reinforcement at exterior 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.
- D. Install all products with screws, ASTM C 1002, corrosion-resistant treated per manufacturer's recommendations.

3.5 APPLICATION OF BASE-COAT CEMENT PLASTER

- A. General: Comply with ASTM C926.
 - 1. Install so that finished plaster surfaces will not deviate more than plus or minus 1/4 inch in 10 ft. from a true plane when measured by a 10-ft. straightedge placed on surface.
 - 2. Install so finished plaster surfaces will be 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.

B. Stucco Base Coats:

1. Scratch Coat:

- a. Apply scratch coat to a minimum thickness of $\frac{3}{8}$ inch, using sufficient trowel pressure to key stucco into lath or to create bond to substrates as applicable.
- b. Prior to initial set, scratch horizontally to provide key for bond of brown coat.
- c. Moist cure scratch coat with clean potable water for at least 48 hours in accordance with ASTM C926 and the building codes following initial application (unless brown coat is applied as soon as the scratch coat has achieved sufficient rigidity to support the brown coat).

2. Brown Coat:

- a. Apply brown coat to a minimum thickness of $\frac{3}{8}$ inch, using sufficient trowel pressure to key stucco into scratch coat.
- b. Rod surface to true plane and float to densify.
- c. Moist cure brown coat with clean potable water for at least 48 hours, in accordance with ASTM C926 and the building codes.

3. Curing: Keep stucco moist for at least 48 hours (longer in dry weather) by lightly fogging walls. Start light fogging after initial set of one to two hours.

C. Leveling and Reinforcing Coat:

1. Allow scratch and brown stucco base coats to set and moist cure a minimum of 48 hours and allow to dry before applying the leveling and reinforcing coat.
2. Using a stainless steel trowel, apply the level coat over the stucco base coats at a thickness of $\frac{1}{16}$ to $\frac{3}{32}$ inches.
 - a. Fully embed the reinforcing mesh into the wet leveling coat including diagonal strips at corners of openings and trowel smooth. For standard mesh, overlap seams by $2\frac{1}{2}$ inches.
 - b. For intermediate mesh, butt seams and cover with strips of detail mesh.

D. Acrylic Bonder and Admixture:

1. For 20/30 or 16/20 cement finishes, use as a surface bonding agent applied over leveling and reinforcing coat.
2. For Santa Barbara Mission Finish or other smooth cement finishes, use as an admixture to the finish coat. Mix 1 quart of Acrylic Bonder & Admix for each 90 lb. bag of Santa Barbara Mission Finish, add the Bonder & Admix at end of the mixing process. Turn blades off after mixing to avoid excessive air entrainment.

3. Apply according to product datasheets and application instructions using a low-pressure sprayer brush or roller (application in direct sunlight may cause the product to dry too quickly).
4. Stucco finishes may be applied after LaHabra Acrylic Bonder & Admix becomes tacky up to 72 hours after application, but not while wet.

3.6 APPLICATION OF CEMENT PLASTER FINISH COATS

- A. General: Comply with ASTM C926.
 1. Do not deviate more than plus or minus 1/4 inch in 10 ft. from a true plane in finished plaster surfaces when measured by a 10-ft. 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, groove finish coat at junctures with metal.
- B. Plaster Finish Coats: Apply according to manufacturer's data sheets and application instructions. Protect from inclement weather until completely dry and cured.
- C. Concealed Exterior Plasterwork: Where plaster application is used as a base for adhered 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 092400

SECTION 092900 - 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. Type X Gypsum Board
- 2. Interior gypsum board.
- 3. Tile backing panels.

B. Related Requirements:

- 1. Section 015719 "Indoor Air Quality (IAQ) Management."
- 2. Section 079200 "Joint Sealants" for acoustical joint sealants installed in gypsum board assemblies.
- 3. Section 093013 "Ceramic Tiling" for ceramic wall tile installed over tile backing panels.

1.3 ACTION SUBMITTALS**A. Product Data: For the following:**

- 1. Gypsum board, Type X.
- 2. Mold-resistant gypsum board.
- 3. Cementitious backer units.
- 4. Glass-mat, water-resistant backing board.
- 5. Interior trim.
- 6. Joint treatment materials.

B. Environmental Submittals:

- 1. Reference Standard: California Green Building Standards Code California Code of Regulations, Title 24, Part 11 (CALGreen).
- 2. All components used in installation of gypsum board to meet requirements of SCAQMD Rule#1168 and Green Seal Standard GC-36 for Adhesives and Sealants. Documentation is required.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 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, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of gypsum panel and joint finishing material from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 GYPSUM BOARD, GENERAL

- A. Manufacturers: Subject to compliance with requirements, provide gypsum board products by one of the following, or approved equal:
 - 1. CertainTeed Corporation.
 - 2. Georgia-Pacific Gypsum LLC.
 - 3. National Gypsum Company.
 - 4. USG Corporation.
- B. 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 C1396/C1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- B. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Core: 5/8 inch, Type X.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.
 - 1. Thickness: 5/8 inch.
 - 2. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- 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 and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping 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 backing panel manufacturer.

2.7 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
 - 1. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

- C. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
- D. Acoustical Sealant: As specified in Section 079200 "Joint Sealants."
- E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

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 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/2-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. 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.
- I. 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 C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: Horizontal and vertical surfaces unless otherwise indicated.
 - 2. Mold-Resistant Type: Horizontal and vertical surfaces at toilet and custodial rooms.
- 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 horizontally (perpendicular to framing) unless otherwise indicated, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLATION OF TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

3.5 INSTALLATION OF TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.
 - 2. LC-Bead: Use at exposed panel edges.
 - 3. L-Bead: Use where indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 4: Mechanical rooms, data rooms and electrical rooms.
 - a. Primer and its application to surfaces are specified in Section 099100 "Painting."
 - 3. Level 5: At all exposed wall and ceiling surfaces.
 - a. Primer and its application to surfaces are specified in Section 099100 "Painting."
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093013 - 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:**

1. Porcelain mosaic tile and cove base
2. Glazed wall tile.
3. Tile backing panels
4. Waterproof / crack isolation membrane.
5. Setting materials
6. Grout materials.
7. Metal finishing, edge protection and transition profiles.
8. Color-match joint sealants.

B. Related Requirements:

1. Section 015719 "Indoor Air Quality (IAQ) Management."
2. Section 033000 "Cast-in-Place Concrete" for slab finishes specified for tile surfaces.
3. Section 079200 "Joint Sealants" for sealing of movement joints in tile surfaces.
4. Section 087100 "Door Hardware" for exterior metal thresholds at floor tile.
5. Section 092900 "Gypsum Board" for tile backing panels.
6. Section 096513 "Resilient Wall Base and Accessories" for resilient transitions at floor tile.

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. Face Size: Actual tile size, excluding spacer lugs.
- C. Module Size: Actual tile size plus joint width indicated.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.
 2. Review existing location of floor drains in relation to overall tile layout.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Environmental Submittals:
 - 1. Reference Standard: California Green Building Standards Code California Code of Regulations, Title 24, Part 11 (CALGreen).
 - 2. All components used in installation of tile to meet requirements of SCAQMD Rule#1168 and Green Seal Standard GC-36 for Adhesives and Sealants. Documentation is required.
- C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of movement joints in tile substrates and finished tile surfaces.
- D. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
 - 2. 6-inch lengths of each type and color of metal finishing and edge-protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each tile-setting and -grouting products.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of 3 years successful in-service performance.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Dry layout of full height wainscot approximately 2-foot-wide tile installation including base and metal finishing trim.
 - 2. Mockups to include specified grout joint widths.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.10 WARRANTY

- A. Manufacturer's Warranty: Submit for Owner's acceptance, manufacturer's standard "system warranty document. Manufacturer's warranty is in addition to and not a limitation of other rights Owner may have under contract Documents.
 - 1. Warranty Period for Ceramic and Porcelain Tile: Manufacturer's standard warranty, but not less than one (1) year limited warranty.
 - 2. Warranty Period for Tile Setting and Grouting Material System: Manufacturer's twenty-five (25) year or Lifetime Product and System limited warranty.
 - 3. Warranties to commence on Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Tile: Obtain tile 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.
 - a. Basis-of-Design Manufacturer: Daltile Corporation; Contact: Irvin Well, phone: 818.929.9098; email: Irvin.weller@daltile.com
- B. Tiling System: Obtain system products from single manufacturer and each aggregate from single source or producer.
 - 1. Basis-of-Design Manufacturer: Custom Building Products.
 - 2. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
 - 3. Obtain waterproof membrane, crack isolation, and other required membranes from manufacturer of setting and grouting materials.
 - 4. Obtain joint sealants from manufacturer of setting and grouting materials.
- C. Accessory Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Backer units.
2. Metal tile finishing and edge protection profiles.

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 unless otherwise indicated.
- 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. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements.
 1. Colors are indicated on Drawings.
 2. Provide tile trim and accessories that match color and finish of adjoining flat tile.
- D. 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.
- E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.3 TILE PRODUCTS

- A. Porcelain Mosaic Floor Tile and Wainscot: Factory mounted unglazed porcelain mosaic tile.
 1. Basis-of-Design Product: Daltile Keystones Porcelain Mosaic Tile.
 2. Module Size: 1 by 1 inch.
 3. Composition: Unglazed porcelain with continuous color.
 4. Thickness: 1/4 inch.
 5. Face: Plain with cushion edges.
 6. Surface: Smooth, without abrasive admixture.
 7. Dynamic Coefficient of Friction, wet & level: Not less than 0.42
 8. Water Absorption per ASTM C373: <0.5%
 9. Breaking Strength per ASTM C648: >250lbs
 10. Scratch Hardness per ASTM MOHS: Resistant
 11. Chemical Resistance per ASTM C650: Resistant
 12. Tile Color and Pattern: As indicated on Drawings.
 13. Grout Color: As indicated on Drawings.
 14. Trim Units: As indicated on Drawings

B. Glazed Wall Field Tile and Cove Base:

1. Basis-of-Design Project: Daltile, Keystones
2. Module Size: 2 by 2 inches
3. Composition: unglazed porecelain.
4. Thickness: 1/4 inch.
5. Face: Plain with cushion edges.
6. Surface: Smooth, without abrasive admixture.
7. Water Absorption per ASTM C373: <0.5%
8. Breaking Strength per ASTM C648: >250lbs
9. Scratch Hardness per ASTM MOHS: 8
10. Chemical Resistance per ASTM C650: Resistant
11. Tile Colors and Patterns: As indicated on Drawings.
12. Grout Color: As indicated on Drawings.
13. Trim Units: As indicated on Drawings

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges in maximum lengths available to minimize end-to-end butt joints.

1. Basis-of-Design Product: USG; Durock Brand Cement Board, or approved equal.
2. Thickness: 5/8 inch.
3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

B. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backing panel manufacturer.

2.5 WATERPROOF AND CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.10 and ANSI A118.12 and is recommended by manufacturer for application indicated.

B. Waterproof and Crack Isolation Membrane, Fluid Applied: Liquid-latex rubber or elastomeric polymer.

1. Basis-of-Design Product: Custom Building Products, RedGard Waterproofing and Crack Prevention Membrane, or approved equal.

2.6 SETTING MATERIALS

A. Polymer Fortified Dry-Set Mortar / Cementitious Bond Coat: ANSI A118.15 TE.

1. Basis-of-Design Product: Custom Building Products, ProLite Premium Large Format Tile Mortar, or approved equal.

- B. Polymer Modified, Fast-Setting Sloping Mortar: ANSI A108.1. For installation at sloped areas around floor drains.

- 1. Basis-of-Design Product: Custom Building Products, SpeedSlope Rapid-Setting Sloping Mortar, or approved equal.

2.7 GROUT MATERIALS

- A. High Performance Chemical-Resistant, Water-Cleanable Tile Setting and Grouting Epoxy: ANSI A108.5. Meets or exceeds, ANSI A118.4TE, A118.15TE and A118.11.

- 1. Basis-of-Design Product: Custom Building Products, CEG-Lite 100% Solids Commercial Epoxy Grout, or approved equal.

2.8 TILE FINISHING AND EDGE PROTECTION PROFILES

- A. Metal Finishing and Edge-Protection Profiles for Walls: Bullnose-type profile with symmetrically rounded visible surface with ¼-inch radius, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.

- 1. Basis-of-Design Product: Schluter-RONDEC.
 - 2. Corners: Provide matching inside corners, outside corners and internal connectors.
 - 3. Profile Height: As required to coordinate with tile selection and setting system.
 - 4. Material and Finish:

- a. AE: Satin Anodized Aluminum.

2.9 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. 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.

2.10 JOINT SEALANTS

- A. Elastomeric Joint Sealant at Movement and Miscellaneous Joints: Provide where indicated on the Drawings, and elsewhere as required at all joints between floors and walls. Conforms to ASTM C 920 for movement joints in heavy traffic areas and ASTM C 794. Color-match to wall and floor grout.

- 1. Basis-of-Design Product: Custom Building Products, Commercial 100% Silicone Sealant, or approved equal.
 - 2. Provide backer rod per Section 079000 "Joint Sealants" at transition between floors and walls.

- B. Elastomeric Joint Sealant at Perimeter of Tile: Paintable sealant per Section 079000 "Joint Sealants."

2.11 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. 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 terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

- B. 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.
- 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.

3.3 INSTALLATION OF CERAMIC TILE SYSTEM

- A. Install tile backing panels and treat joints in accordance with ANSI A108.11 and manufacturer's written instructions for type of application indicated.
- B. Install waterproof / crack isolation membrane to comply with ANSI A108.13, ANSI A108.17 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
 - 1. Allow waterproof / crack isolation membrane to cure before installing tile or setting materials over it.
- C. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
 - 1. Add materials, water, and additives in accurate proportions.
 - 2. 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.
- D. Install tile in accordance with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods and specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. 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.
 - 2. 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.
 - 3. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
 - 4. 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.

- a. 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.
 - b. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - c. 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.
5. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - a. Porcelain Mosaic Floor Tile and Base: $\pm 1/8$ inch.
 - b. Glazed Wall Tile: $1/16$ inch.
 - c. Porcelain Mosaic Accent Wall Tile: $\pm 1/8$ inch.
6. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- E. Movement Joints: Provide movement joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated on Drawings. 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.
- F. Metal Finishing and Edge-Protection Profiles: Install at top of wainscot tiles and at outside corners.

3.4 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.

3.5 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.

SECTION CONTINUES ON FOLLOWING PAGE

3.6 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete:

1. TCNA F115: Thinset mortar bonded to concrete with membrane per TCNA F-125-Full.
 - a. Sloping Mortar at Drains: Polymer-modified, fast-setting sloping mortar:
 - b. Waterproof / Crack Isolation Membrane: Fluid-applied membrane.
 - c. Thinset Mortar / Cementitious Bond Coat: Polymer-fortified dry-set mortar.
 - d. Grout: Water-cleanable epoxy.

B. Interior Wall Installations, Wood Studs or Furring:

1. TCNA W244C: Thinset mortar on cementitious backer board.
 - a. Waterproof / Crack Isolation Membrane: Fluid-applied membrane (extend 6 inches up wall).
 - b. Thinset Mortar / Cementitious Bond Coat: Polymer-fortified dry-set mortar.
 - c. Grout: Water-cleanable epoxy.

C. Movement Joints: TCNA Detail EJ171, appropriate types indicated on Drawings.

END OF SECTION 093013

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SECTION 095113 - 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. This Section includes the following:
 - 1. Acoustical panels.
 - 2. Metal suspension system.
 - 3. Metal edge moldings and trim.
- B. Related Requirements:
 - 1. Section 018119 "Indoor Air Quality Requirements."
 - 2. Section 061000 "Rough Carpentry" for required blocking for metal suspension system anchors and braces.
 - 3. Section 092900 "Gypsum Board."
 - 4. Section 097723 "Vinyl-Wrapped Tack Panels."
 - 5. Division 23 – Heating, Ventilating and Air Conditioning.
 - 6. Division 26 – Electrical.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Acoustical panels.
 - 2. Metal suspension system.
 - 3. Metal edge moldings and trim.

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-system members.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Method of attaching hangers to building structure.
 - 4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
 - 5. Items penetrating finished ceiling and ceiling-mounted items including the following:

- a. Lighting fixtures.
- b. Diffusers
- c. Grilles.
- d. Perimeter moldings.

6. Minimum Drawing Scale: 1/4 inch = 1 foot.

- B. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Evaluation Reports: For each acoustical panel ceiling suspension system, from ICC-ES.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site 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.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, 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.

1.9 WARRANTY

- A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

1. Acoustical Panels: Sagging and warping.
 2. Grid System: Rusting and manufacturer's defects.
- B. Warranty Period:
1. Acoustical panels: Ten years from date of substantial completion.
 2. Suspension: Ten years from date of substantial completion.
 3. Ceiling System: Thirty years from date of substantial completion.
- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

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.
- B. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products by Armstrong World Industries,

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- 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: Class A according to ASTM E1264.
 2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS

- A. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- B. Acoustical Panel Type AP-1:
1. Basis-of-Design Product: Armstrong School Zone Fine Fissured 1714.
 2. Classification: Ceiling panels complying with ASTM E 1264 for type, form and pattern as follows:
 - a. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.

- b. Pattern: CE (perforated, small holes and lightly textured).
- 3. Color: White.
- 4. Light Reflectance (LR): Not less than 0.82.
- 5. Ceiling Attenuation Class (CAC): Not less than 40.
- 6. Noise Reduction Coefficient (NRC): Not less than 0.70.
- 7. Edge/Joint Detail: Square.
- 8. Thickness: 3/4 inch.
- 9. Modular Size: 24 by 48 inches.

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL CEILING PANELS

- A. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification, and finish indicated.
- B. Narrow Face, Capped, Double Web, Cold Rolled Steel Suspension System: Main and Cross Tees as defined by ASTM C635, commercial quality pretreated and painted hot-dipped galvanized cold-rolled steel, exposed surfaces prefinished in manufacturer's standard corrosion resistant enamel paint finish:
 - 1. Basis of Design Product: Armstrong Prelude XL 15/16" Exposed Tee.
 - 2. Structural Classification: Heavy Duty.
 - 3. Tee Profile: Narrow Face 15/16" wide.
 - 4. Main Tee Height: 1-11/16"
 - 5. Cross Tee Height: 1-11/16"
 - 6. Grid Module: As noted on Drawings.
 - 7. Rated Load, 4-Foot Hanger Spacing: 12 lbs/LF.
 - 8. Fire Rating: Class A.
 - 9. Color: White (WH).

2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, 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 A641/A641M, Class 1 zinc coating, soft temper.
 - 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than indicated on Drawings.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- B. Wall Molding: Inside Corner: Field-mitered joints at wall molding. Prefabricated corner cap; formed to 90° angle; hemmed edge; size and finish to match wall molding. Outside Corner: Prefabricated corner cap; formed to 90° angle; hemmed edge; size and finish to match wall molding.
 - 1. Angle shape; 7/8" thick mounting flange by 7/8" thick face flange; hemmed edges; exposed surface pre-finished to match suspension system components.
 - 2. Available Product: 7800.
- C. Seismic Attachment Clip: Used to attach tee ends to perimeter angle for seismic design D-F categories.
 - 1. Available Product: BERC-2 beam end retaining clip.

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 unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C636/C636M, 2019 California Building Code (CBC) seismic design requirements, ICC ESR-1222 and manufacturer's written instructions. Installation shall meet all requirements of Division of the State Architect (DSA) IR 25-2.13 with no exceptions.
- 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 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 to structure 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. 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.
 - 7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- 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. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
 - 2. 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 precise fit.
 - 1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.

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: Owner will engage a qualified special inspector to perform the following special inspections and prepare reports:
 - 1. Suspended ceiling system.
 - 2. Hangers, anchors and fasteners.

3.6 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

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SECTION 096513 - 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. Thermoplastic-rubber wall base.
 - 2. Rubber molding accessories.
 - 3. Vinyl molding accessories.
- B. Related Requirements:
 - 1. Section 024119 "Selective Demolition" for removing existing floor coverings.
 - 2. Section 096519 "Resilient Tile Flooring for luxury vinyl tile.
 - 3. Section 096813 "Tile Carpeting" for modular carpet tiles (walk-off mats).
 - 4. Section 096816 "Sheet Carpeting" for carpet with attached cushion.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples.
- C. Product Schedule: For resilient base and accessory products.

1.4 QUALITY ASSURANCE

- A. Installation Qualification: Contractors for floor covering installation should be experienced in managing commercial flooring projects and provide professional installers, qualified to install the various flooring materials specified.

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 55 deg F or more than 85 deg F.
- B. Store resilient products per manufacturer's recommendations; all cartons must be stored on a dry, flat level surface.

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 85 deg F, in spaces to receive resilient products during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Site-condition flooring, accessories, and adhesives 48 hours prior to installation. The location selected for site -conditioning must be either the room where the flooring/accessories will be installed or have similar ambient temperature and relative humidity readings as the room where the flooring will be installed.
- C. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 85 deg F.
- D. Maintain the ambient relative humidity between 40% and 60% during installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis-of-Design: Tarkett North America (Johnsonite), 30000 Aurora Road, Solon Ohio 44139, Contact: Kasey Smith, Phone: 805-210-0999, E-mail: Kasey.Smith@tarkett.com.

2.2 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.

2.3 THERMOPLASTIC-RUBBER WALL BASE

- A. Tarkett Traditional Thermoplastic Rubber Wall Base.
- B. Product Standard: ASTM F1861, Type TP (rubber, thermoplastic).
 - 1. Group: I (solid, homogeneous).
 - 2. Type: Coved.
- C. Thickness: 0.125 inch.
- D. Height: As indicated on Drawings.

- E. Lengths: 120 feet long coil.
- F. Outside and Inside Corners: Job formed following manufacturer's resilient wall base installation instructions for Field-Made Outside and Inside Corners.
- G. Colors: As indicated on drawings.
- H. Test Data:
 - 1. Flexibility, ASTM F137: Passes ¼ inch mandrel.
 - 2. Resistance to light, ASTM F1515: Passes.
 - 3. Resistance to chemicals, ASTM F925: Passes.
 - 4. ASTM E 648, Standard Test Method for Critical Radiant Flux of .045 watts/cm² or greater,
 - 5. Class 1.

2.4 VINYL MOLDING ACCESSORY (TRANSITIONS)

- A. Tarkett/Johnsonite Finishing Accessories.
 - 1. Static Coefficient of Friction: ≥0.8, ASTM D2047.
 - 2. Hardness: 85 SHOREA, ASTM D2240.
 - 3. Chemical Resistance: ASTM F925.
 - 4. Static Load Limit: ASTM F970.
 - 5. Resistance to Heat: ASTM F1514.
 - 6. Resistant to Light: ASTM F1515.
 - 7. Residual Indentation: ASTM F1914.
 - 8. Flammability: ASTM E648.
 - 9. Smoke Density: ASTM E662.

B. Profile and Dimensions: As indicated on drawings.

C. Colors and Patterns: As indicated on drawings.

2.5 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
2. 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 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 096513

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SECTION 097720 - FIBERGLASS REINFORCED WALL PANELS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes: Prefinished polyester glass reinforced plastic sheets and adhered to unfinished gypsum wallboard.
 - 1. PVC Trim.
- B. Products Not Furnished or Installed under This Section:
 - 1. Gypsum substrate board.
 - 2. Resilient Base.

1.2 RELATED SECTIONS

- A. Section 061000 "Rough Carpentry."
- B. Section 092900 "Gypsum Board."
- C. Section 096513 "Resilient Base and Accessories."

1.3 REFERENCES

- A. American Society for Testing and Materials: Standard Specifications (ASTM)
 - 1. ASTM D 256 - Izod Impact Strengths (ft #/in)
 - 2. ASTM D 570 - Water Absorption (%)
 - 3. ASTM D 638 - Tensile Strengths (psi) & Tensile Modulus (psi)
 - 4. ASTM D 790 - Flexural Strengths (psi) & Flexural Modulus (psi)
 - 5. ASTM D 2583 - Barcol Hardness
 - 6. ASTM D 5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
 - 7. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

- A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.

- B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- C. Selection Samples: Submit manufacturer's standard color pattern selection samples representing manufacturer's full range of available colors and patterns.
- D. Manufacturers Material Safety Data Sheets (MSDS) for adhesives, sealants and other pertinent materials prior to their delivery to the site (available as downloads for most Marlite's products at <http://www.marlite.com/tech-details.aspx> or by contacting Marlite at info@marlite.com).

1.5 QUALITY ASSURANCE

- A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
 - 1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)
 - a. Wall Required Rating – Class A.
- B. Sanitary Standards: System components and finishes to comply with:
 - 1. United States Department of Agriculture (USDA) requirements for food preparation facilities, incidental contact.
 - 2. Food and Drug Administration (FDA) 1999 Food Code 6-101.11.
 - 3. Canadian Food Inspection Agency (CFIA) requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials factory packaged on strong pallets.
- B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (range of 60 to 75°F) for 48 hours prior to installation.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work
- B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
 - 1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

1.8 WARRANTY

- A. Furnish one year guarantee against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- A. Marlite; 1 Marlite Drive, Dover, OH 44622. 800-377-1221 FAX (330) 343-4668 Email: info@marlite.com
www.marlite.com.
- B. Product:
 - 1. Standard FRP; Class A.

2.2 PANELS

- A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
 - 1. Coating: Multi-layer print, primer and finish coats or applied over-layer.
 - 2. Dimensions:
 - a. Thickness – 0.090 " (2.29mm) nominal
 - b. Width - 4'-0" (1.22m) nominal
 - c. Length – 8'-0" (2.4m)
 - 3. Tolerance:
 - a. Length and Width: +/-1/8 " (3.175mm)
 - b. Square - Not to exceed 1/8 " for 8 foot (2.4m) panels or 5/32 " (3.96mm) for 10 foot (2.4m) panels
- B. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
 - 1. Flexural Strength - 1.0×10^4 psi per ASTM D 790. (7.0 kilogram-force/square millimeter)
 - 2. Flexural Modulus - 3.1×10^5 psi per ASTM D 790. (217.9 kilogram-force/square millimeter)
 - 3. Tensile Strength - 7.0×10^3 psi per ASTM D 638. (4.9 kilogram-force/square millimeter)
 - 4. Tensile Modulus - 1.6×10^5 psi per ASTM D 638. (112.5 kilogram-force/square millimeter)
 - 5. Water Absorption - 0.72% per ASTM D 570.
 - 6. Barcol Hardness (scratch resistance) of 35 55 as per ASTM D 2583.
 - 7. Izod Impact Strength of 72 ft. lbs./in ASTM D 256
- C. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.
- D. Front Finish: P-100 White, Pebble Finish
- E. Size: Marlite FRP - 48" x 96" x .090" nominal.

2.3 MOLDINGS

- A. PVC Trim:
 - a. M350 Inside Corner, 8' length

- b. M360 Outside Corner, 8' length
- c. M365 Division, 8' length
- d. M370 Edge, 8' length

- 2. Color: P-100 White

2.4 ACCESSORIES

- A. Fasteners: Non-staining nylon drive rivets.

- 1. Match panel colors.
- 2. Length to suit project conditions.

- B. Adhesive: Either of the following construction adhesives complying with ASTM C 557.

- 1. Marlite C-551 FRP Adhesive - Water- resistant, non-flammable adhesive.
- 2. Marlite C-915 Construction Adhesive - Flexible, water-resistant, solvent based adhesive, formulated for fast, easy application.
- 3. Titebond Advanced Polymer Panel Adhesive – VOC compliant, non-flammable, environmentally safe adhesive.

- C. Sealant:

- 1. Marlite Brand MS-250 Clear Silicone Sealant.
- 2. Marlite Brand MS-251 White Silicone Sealant.
- 3. Marlite Brand - Color Match Sealant.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.

- 1. Verify that stud spacing does not exceed 24" (61cm) on-center.

- B. Repair defects prior to installation.

- 1. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

3.2 INSTALLATION

- A. Comply with manufacturer's recommended procedures and installation sequence.

- B. Cut sheets to meet supports allowing 1/8" (3 mm) clearance for every 8 foot (2.4m) of panel.

1. Cut and drill with carbide tipped saw blades or drill bits, or cut with shears.
 2. Pre-drill fastener holes 1/8" (3mm) oversize with high speed drill bit.
 - a. Space at 8" (200mm) maximum on center at perimeter, approximately 1" from panel edge.
 - b. Space at in field in rows 16" (40.64cm) on center, with fasteners spaced at 12" (30.48 cm) maximum on center.
- C. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.
1. Install panels with manufacturer's recommended gap for panel field and corner joints.
 - a. Adhesive trowel and application method to conform to adhesive manufacturer's recommendations.
 - b. Drive fasteners for snug fit. Do not over-tighten.
- D. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.
1. All moldings must provide for a minimum 1/8 " (3mm) of panel expansion at joints and edges, to insure proper installation.
 2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.3 CLEANING

- A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.
- B. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION 097720

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SECTION 097723 - VINYL-WRAPPED TACK PANELS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes shop-fabricated, vinyl fabric-wrapped tackable wall panels.

1. Aluminum trim wrapped in vinyl fabric.

- B. Related Sections:

1. Section 015719 "Indoor Air Quality (IAQ) Management."
2. Section 061100 "Rough Carpentry" for coordination with blocking.
3. Section 101100 "Visual Display Units" for installation coordination.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

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

1. Include fabric facing, panel edge, core material, and mounting indicated.

- B. Shop Drawings: For panel assembly and installation.

1. Include plans, elevations, sections, and mounting devices and details.
2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.
3. Include details at cutouts and penetrations for other work.
4. Include direction of fabric weave and pattern matching.

- C. Samples for Verification: For the following products:

1. Fabric: 12-inch by 12-inch Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
2. Panel Edge: 12-inch- long Sample(s) showing each edge profile, corner, and finish.
3. Core Material: 12-inch-square Sample at corner.
4. Mounting Devices: Full-size Samples.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: 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:

1. Electrical outlets, switches, and thermostats.
2. Items penetrating or covered by panels including, but not limited to, the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Clock/Speakers.
 - d. Alarms.
 - e. Sprinklers.
 - f. Access panels.
 - g. TV Mounting Brackets.
3. Show operation of hinged and sliding components covered by or adjacent to panels.

B. Product Certificates: For each type of panel.

C. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of panel to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal instructions.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.

1. Build mockup of typical wall area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and 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.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install 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 panels until a lighting level of not less than 50 fc is provided on surfaces to receive the panels.
- C. Air-Quality Limitations: Protect 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 panel locations and actual dimensions of openings and penetrations by field measurements before fabrication and indicate them on Shop Drawings.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace panels and components 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.
 - b. Warping of core.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design: Chatfield Clarke, 14614 Valley Blvd, Fontana, CA 92335, Phone: 909-823-4297.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Panels shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: Finish materials shall be classified in accordance with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency. Flame spread index shall be not greater than specified in CBC 803.13 for the group and location designated. Materials tested in accordance with NFPA 286 and meeting the acceptance criteria of CBC Section 803.1.1 shall be permitted to be used where a Class A classification in accordance with ASTM E84 of UL 723 is required. Completed vinyl-wrapped tack panels shall conform to the following:
 - a. Class A:
 - 1) Flame-Spread Index: 25 or less.
 - 2) Smoke-Developed Index: 450 or less.

2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

2.3 VINYL FABRIC-WRAPPED WALL PANELS

- A. Vinyl Fabric-Wrapped Wall Panel "Tack Wall": Manufacturer's standard panel construction consisting of facing material laminated to front face, edges, and back edge border of core.

1. Vinyl Fabric: Koroseal, Insight, color as noted on drawings.
 - a. Meets or exceeds Type II requirements in Federal Specification CCC-W-408A
 - b. Meets CA 01350 indoor air quality requirements.
 - c. Total Weight: 20 oz/linear yard.
 - d. Average Thickness: 0.017 to 0.021 inches.
 - e. Tensile (typical): 50 x 55 lbf minimum.
 - f. Tear (typical): 25 x 25 minimum
 - g. ASTM E84, Class A.
 - h. Flame Speed: 25 or less.
 - i. Smoke Developed: 450 or less.
2. Panel Shape: Flat.
3. Mounting:
 - a. Back mounted with manufacturer's standard adhesive, secured to substrate.
 - b. Adhesive: Henry's 317 Multipurpose Construction Adhesive 30 oz, or manufacturer's approved equal.
 - c. Fasteners: Stainless Steel
4. Core: Manufacturer's standard industrial insulation board.
 - a. ASTM E84, Class B or Class 2.
 - b. Thickness: 1/2-inch.
 - c. Density: 6 pounds per cubic foot.
5. Trim and Joints: Vinyl-wrapped over PVC trim:
 - a. J Molding.
 - b. Outside Corner.
 - c. Butt joints: Wrap vinyl edges at intermediate joints.
6. Nominal Overall Panel Thickness: 1/2 inch.
7. Panel Width: 48 inches maximum.
8. Panel Height: 120 inches maximum.
9. Extension Ring: To accommodate devices that occur at tackable wall panels.

2.4 FABRICATION

- A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
- B. Edge Hardening: For mineral-fiber board cores, chemically harden core edges and areas of core where mounting devices are attached.
- C. Core-Face Layer and Core Overlay: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.
- D. Facing Material and Lining Material: Apply fabric fully covering visible surfaces of panel; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
 - 1. Square Corners: Tailor corners. Heat-seal vinyl fabric seams at corners.
 - 2. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent panels.
- E. Dimensional Tolerances of Finished Panels: Plus or minus 1/16 inch for the following:
 - 1. Thickness.
 - 2. Edge straightness.
 - 3. Overall length and width.
 - 4. Squareness from corner to corner.
 - 5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fabric, fabricated panels, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting panel performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panels in locations indicated. Unless otherwise indicated, install panels with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with manufacturer's written instructions for installation of panels using type of mounting devices indicated. Mount panels securely to supporting substrate.
- C. Align fabric pattern and grain with adjacent panels.

- D. Coordinate with electrical, mechanical, and other devices to install extension rings to accommodate additional depth.

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus 1/16 inch in 48 inches, noncumulative.
- B. Variation of Joint Width: Acceptable tolerance of vertical joint is 3/16".

3.4 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 097723

SECTION 099100 - PAINTING**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. Surface preparation of new and existing surfaces.
2. Primers.
3. Finish coatings.

B. Related Sections:

1. Section 021000 "Hazardous Materials Abatement (Asbestos and Lead Abatement)" for abatement of lead-based paint materials.
2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
3. Section 071910 "Concrete Floor Sealer" for interior concrete floor sealer.
4. Section 323119 "Decorative Metal Fences and Gates" for shop priming exterior decorative metal assemblies.

1.3 REFERENCES

- A. ANSI/ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.
- B. ASTM D2016 - Test Method for Moisture Content of Wood.

1.4 DEFINITIONS**A. General: Standard coating terms defined in ASTM D 16 apply to this Section.**

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
3. Satin refers to low-sheen finish with a gloss range between 10 and 35 when measured at a 60-degree meter.
4. Semi-gloss refers to medium-sheen finish with a gloss range between 30 and 70 when measured at a 60-degree meter.
5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.5 ACTION SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.
 - 1. Include preparation requirements and application instructions.
 - 2. Materials List: Provide an inclusive list of required coating materials. Include each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 3. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
 - 4. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Samples for Verification (Drawdowns): For each type of paint system and each color and gloss topcoat to be applied.
 - 1. Samples to be minimum 8 inches square.
 - 2. Use representative colors when preparing samples for review. Resubmit until required sheen and color are achieved.
 - 3. Label each Sample for location and application area.
- C. Product Schedule: Use same designations indicated on Drawings and in the Painting Schedules to cross-reference paint systems specified in this Section. Include color designations.
- D. Benchmark Samples (Mockups): Subsequent to approval of Samples for Verification (Drawdowns), prepare interior and exterior mockups per the Quality Assurance article of this Section.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, name and addresses of Architect and Owner, and other specified information.

1.7 MAINTENANCE MATERIALS SUBMITTALS

- A. At completion of painting, label all paint containers with remaining materials and deliver to Owner.
- B. Provide one new unopened five-gallon container of each material, color and finish to the Owner. Deliver to location designated by Owner within a 25-mile radius of Project Site.
 - 1. Label containers with color name and code, date, and readable manufacturer's label describing material.
- C. Deliver maintenance materials to location designated by Owner within a 25-mile radius of Project Site.

1.8 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator specializing in commercial painting and finishing with five years of experience and acceptable to product manufacturer.
- B. Benchmark Samples (Mockups): Apply mockups of each paint system indicated and each color and finish selected to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Provide a minimum of one interior mockup and one exterior mockup as indicated on Drawings to represent surfaces and conditions for each type of coating and substrate to be painted.
 - a. Wall (Vertical) Surfaces: Provide samples on at least 100 square feet of wall surface. Vertical surface Mockup to include door assemblies, fascia (where occurs) and trim.
 - b. Small Areas and Items: The Architect will designate items or areas as required.
 - c. If preliminary color selections are not approved, apply up to two additional interior and exterior mockups using colors selected by Architect at no added cost to Owner.
 - 2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
 - 3. Final approval of color selections will be based on mockups.
 - 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
 - 8. VOC content.
- B. Store materials not in use tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing.
2. Maintain containers in clean condition, free of foreign materials and residue.
3. Remove rags and waste from storage areas daily.
4. Take necessary measures to ensure that workers and Work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.10 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F or in accordance with manufacturer's instructions.
- B. Do not apply paint in rain, fog, or mist; or when the relative humidity exceeds 80 percent unless required otherwise by manufacturer's instructions; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 1. Project site is near the ocean and is often subject to fog.
 2. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.
- C. Lead-Containing Materials: Removal of lead-containing materials is included in Section 021000 "Hazardous Materials Abatement (Asbestos and Lead Abatement)." Should painter encounter lead-containing materials during performance of the Work, immediately notify Construction Manager and Inspector. Discontinue Work on lead-containing materials and move personnel to other Work on the building until lead-containing materials are removed.
- D. Do not apply any coating before required test reports, certificates, and requests for substitutions have been submitted and the respective material approved for use on this project. Submit all requests for substitutions for approval. Each such request shall include specific identification of the proposed substitute; justification for the necessity of the substitution; certified test reports of the proposed substitute, including all tests required by the specification for the substituted material; and a tabulation of the special material compared to the proposed substitute.
 1. The tabulation shall include all tests, composition of both pigment and vehicle, and quantitative and qualitative requirements for both the specified and the proposed material; clearly indicate any deviations from specified requirements.

1.11 PRECONSTRUCTION CONFERENCE

- A. One week prior to operations convene a preconstruction conference, require attendance of parties affecting work of this section and shall include but not be limited to, painting contractor, his foreman and crew that will be performing these operations, Architect, and Inspector.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. District Standard Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers (substitutions not allowed):
 - 1. The Sherwin-Williams Company (Basis-of-Design).
 - 2. Dunn Edwards.
- B. Manufacturer Contact (Sherwin-Williams):

Rocky Berlanga (Orange County and Central California)
2100 W Orangewood Ave, Ste #100
Orange, CA 92868
Phone: 657-269-0922
Cell: 657-269-0922
Email: rocky.m.berlanga@sherwin.com
- C. Source Limitations: Obtain each paint product from single source from single manufacturer.
- D. Comparable Products: Comparable products of approved manufacturers will be considered in accordance with Section 016000 "Product Requirements," and the following:
 - 1. Products are approved by manufacturer in writing for application specified.
 - 2. Products meet performance and physical characteristics of basis-of-design products including published ratio of solids by volume, plus or minus two percent.

2.2 PAINT PRODUCTS, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturer for use in paint system and on substrate indicated.
- B. Compliance with Regulatory Requirements: Provide paint products in compliance with the California Air Resources Board (CARB) VOC requirements.
- C. Colors: Match colors indicated by reference to the manufacturer's color designations.
- D. Materials Quality: Provide the manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Name: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish the manufacturer's material data and certificates of performance for proposed substitutions. Comply with Division 01 Section "Product Requirements".

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. Masonry (Clay and Concrete Masonry Units): 12 percent.
 4. Wood: 15 percent.
 5. Gypsum Board: 12 percent.
 6. Plaster: 12 percent.
- C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.
- D. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations 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 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. 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. Uncoated Steel Substrates: Remove rust and, loose mill scaler, if any. Clean using methods recommended in writing by paint manufacturer.
- 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 from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Ferrous-Metal Substrates: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Prime bare steel surfaces. Remove rust, loose mill scale, and other foreign substances using methods recommended by the paint manufacturer. Protect from corrosion until coated.
- J. 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.
- K. Fiber Cement Siding and Trim: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 INSTALLATION

- 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 both faces and top, bottom and side edges of doors and entire exposed surface of exterior door frames.

4. Paint entire exposed surfaces of hollow metal window frames and sashes and wood window sills.
 5. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 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 at exterior locations and where exposed to view inside occupied interior spaces:
 - a. Electrical 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. Other items as directed by Architect.
 2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces. Paint to be flat black.

3.4 FIELD QUALITY CONTROL

- A. Dry-Film Thickness Testing: Owner 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.
 - 1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
 - 2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
 - 3. Allow empty paint cans to dry before disposal.
 - 4. Collect waste paint by type and deliver to recycling or collection facility.
- 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: (Not all Paint Systems apply)

- A. (P1B) Exterior Wood, Fiber Cement Trim, Opaque Finish, Semi-Gloss:
Primer: SW, PrepRite ProBlock Primer/ Sealer. B51 Series
Finish: 2 coats – SW, SuperPaint Exterior Latex Gloss, A84 Series
- B. (P1I) Exterior Fiber Cement Panels, Satin:
Primer: SW, PrepRite ProBlock Primer/ Sealer. B51 Series
Finish: 2 coats – SW, SuperPaint Exterior Latex Satin, A89 Series
- C. (P6C) Exterior Concrete, CMU and Cement Plaster, Eggshell:
Primer: Loxon Primer-Sealer LX Series
Or
Primer: SW, PrepRite Block Filler, B25W25, (FOR USE ON UNPAINTED CMU ONLY)
Finish: 2 coats – SW, SuperPaint Exterior Latex Low Lustre, A78 Series
- D. (P6I) CMU, Finish, Satin:
Primer: SW, PrepRite Block Filler B25W25
Finish: 2 coats – SW, SuperPaint Exterior Latex Satin, A89 Series
- E. (P7B) Exterior Hollow Metal Doors and Door Frames, Steel Columns & Downspout Pipes, Semi-Gloss:
Primer: SW, Pro Industrial Pro-Cryl Universal Primer, B66-1300

Finish: 2 coats – SW, Pro Industrial Acrylic Semi-Gloss, B66-650 Series

3.7 INTERIOR PAINTING SCHEDULE: (Not all Paint Systems apply)

- A. (P21B) Interior Wood, Standing and Running Trim, Opaque Finish, Semi-Gloss:
Primer: SW, PrepRite ProBlock Primer/ Sealer, B51 Series
Finish: 2 coats – SW, Pro Industrial Acrylic Semi-Gloss, B66-650 Series
- B. (P25B) Interior Drywall and Plaster, Semi-Gloss:
Primer: SW, ProMar 200 Primer, B28W2600 Series
Finish: 2 coats – SW, ProMar 200 HP SG, B31-1900 Series
- C. (P27B) Interior CMU, Semi-Gloss:
Primer: SW, PrepRite Block Filler, B25W25, (FOR USE ON UNPAINTED CMU ONLY)
Finish: 2 coats – SW, ProMar 200 HP SG, B31-1900 Series
- D. (P28B) Interior Ferrous/Galvanized Metal, Semi-Gloss:
Primer: SW, Pro Industrial Pro-Cryl Universal Primer, B66-1300
Finish: 2 coats – SW, Pro Industrial Acrylic Semi-Gloss, B66-650 Series
- E. (P28H) Interior Ferrous/Galvanized Metal, Flat:
Primer: SW, Pro Industrial Pro-Cryl Universal Primer, B66-1300
Finish: 2 coats – SW, Pro Industrial Acrylic Matte, B66-670 Series
- F. (P28I) Interior Ferrous/Galvanized Metal, Eggshell:
Primer: SW, Pro Industrial Pro-Cryl Universal Primer, B66-1300
Finish: 2 coats – SW, Pro Industrial Acrylic Eg-Shel, B66-660 Series
- G. (P32H) Interior Plywood, Fire-Resistant, Opaque Finish, Flat (Matte):
Primer: Flame Control No 3003 Acrylic Primer
Finish: 2 coats – Flame Control No 20-20A

END OF SECTION 099100

SECTION 101100 - VISUAL DISPLAY UNITS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Visual display board assemblies.
2. Accessories.

B. Related Requirements:

1. Section 061100 "Rough Carpentry" for continuous backing at visual display units.
2. Section 097723 "Vinyl-Wrapped Track Panels" for tackable, vinyl-covered panels mounted on walls.

1.2 ACTION SUBMITTALS**A. Product Data Submittals: For each 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.
3. Include sections of typical trim members.

C. Product Schedule: For visual display units.**1.3 INFORMATIONAL SUBMITTALS****A. Qualification Data: For Installer.****B. Product Test Reports: For each visual display unit, for tests performed by a qualified testing agency.****C. Sample Warranties: For manufacturer's special warranties.****1.4 CLOSEOUT SUBMITTALS****A. Operation and Maintenance Data: For visual display units to include in maintenance manuals.**

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.7 FIELD 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.

1.8 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, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces exhibit crazing, cracking, or flaking.
 - 2. Warranty Period:
 - a. Life of the Building.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design: Claridge Products and Equipment, Inc., 480 Wrangler Drive, Suite 200, Coppell TX 75019, Phone: 800-364-2422

2.2 PERFORMANCE REQUIREMENTS

- A. 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: 450 or less.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 VISUAL DISPLAY BOARD ASSEMBLIES

- A. Visual Display Board Assemblies: Factory fabricated, fixed units.
 - 1. Series 1 Markerboard.
 - a. Assembly: Markerboard.
 - b. Corners: Square.
 - c. Width: As indicated on Drawings.
 - d. Height: As indicated on Drawings.
 - e. Mounting Method: Direct to wall.
- B. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.
 - 1. LCS³ porcelain enamel steel.
 - 2. Accepts magnetic aides.
 - 3. Color: 100 White.
- C. Aluminum Frames and Trim: Factory built trim fabricated from not less than 0.062-inch- thick, extruded aluminum; standard size and shape.
 - 1. Perimeter Trim: 1-1/2 inches wide with mitered corners.
 - 2. Aluminum Finish: Clear anodic finish.
- D. Marker Tray:
 - 1. Model 371A continuous hollow aluminum tray with end closures at bottom of each markerboard.
- E. Display Rail: Manufacturer's standard, extruded-aluminum display rail with plastic-impregnated-cork insert, end stops, designed to hold accessories.
 - 1. Size: 1 inch high by full length of visual display unit.
 - 2. Map Hooks: Two map hooks at each display rail.
 - 3. Flag Holder: One for each classroom.
 - 4. Tackboard Insert Color: Natural cork.
 - 5. Aluminum Color: Match finish of visual display assembly trim.

2.4 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 high-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.

1. MDF Core: 7/16 inch thick; with manufacturer's standard moisture-barrier backing.
 2. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.
- B. High-Pressure Markerboard Laminate Panels: Factory-laminated markerboard panel of three-ply construction, consisting of backing, fiberboard core material, and high-pressure markerboard laminate writing surface.

2.5 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. Medium Density Fiberboard (MDF): ANSI A208.2, Grade 130.
- D. Extruded Aluminum: ASTM B221, Alloy 6063.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500 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.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker with 201-R1 satin anodize finish.

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

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.

3.3 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Factory-Fabricated Visual Display Board Assemblies:
 - 1. 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.
- C. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings.

3.4 CLEANING AND PROTECTION

- A. Clean visual display units in accordance with 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 101100

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SECTION 101423 - PANEL SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Panel Signs: Fixed, frameless acrylic panel signs and accessories.
 - a. Refer to Drawings for sign types, locations and message schedule.
- 2. All supplementary parts and components, hardware, mounting adhesives or other miscellaneous supports and materials required for complete installation.
- 3. Installation of all signs.

- B. Related Sections:

- 1. Section 015719 "Indoor Air Quality (IAQ) Management."
- 2. Section 101426 "Post and Panel Signage" for freestanding site signage.

1.3 REGULATORY REQUIREMENTS

- A. Comply with the Americans with Disabilities Act (ADA) and with code provisions adopted by the State of California, Division of the State Architect (DSA).
- B. Signage shall comply with 2022 California Building Code (CBC) Sections 1004.3, 1013.4, 11B-216 and 11B-703.

1.4 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.5 SUBMITTALS

- A. Product Data. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- B. Shop Drawings: Submit shop drawings to scale; indicating sign styles, large-scale details of wording, lettering font and height, Tactile and Braille layout, Pictograms, foreground and

background colors, each sign location, edge details, mounting heights, and overall dimensions and thickness of each sign. Show attachments, layout, reinforcement, accessories, and installation details.

1. Sign Contractor is required to obtain an approved reviewed set of shop drawings (reviewed by the Architect) prior to fabricating any sign products.

C. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Product Data: For acrylic sheet products, indicating that product is RoHS compliant, PVC-free, contains no formaldehyde and is Phenol free.

D. Sign Schedule: Submit proposed schedule for each sign, including message text/symbols and arrangement, sign location relative to room or door number, quantity, sign material and colors.

E. Samples for Verification: Project-specified samples as follows:

1. Must be reviewed prior to fabrication.
2. Provide two Samples of each of the following specified sign types for each material used:
 - a. Panel Signs: Tactile.
3. If approved, one sample of each will be returned for installation and one sample will be retained by the Architect as a record copy.
4. The Owner reserves the right to modify sign text and lettering layout during the Shop Drawing review phase at no additional cost to the Owner.

F. Manufacturer's Installation Instructions: Submit on fasteners and anchors, adhesives and tape.

1.6 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain signs through one source from a single manufacturer.

B. Manufacturer: Company specializing in manufacturing Products specified in this section with a minimum of five years documented experience and sufficient production capacity to produce sign units required without causing delay in the Work.

- C. Installer: Company experienced in installing signage similar to that indicated for this Project with a minimum of three years of documented experience.

1.9 DELIVERY, STORAGE AND HANDLING

- A. All signage materials shall be protected during fabrication, shipment, site storage and installation to prevent environmental damage or damage from other trades. Deliver signs in manufacturer's original boxes, properly labeled with corresponding sign messages as the signs packed within. Store signs inside a well-ventilated area and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.
- B. Store adhesive and attachment tape at ambient room temperatures.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. See Section 015719 "Indoor Air Quality (IAQ) Management" for environmental conditions affecting products on site.
- B. Do not install signs when the ambient temperature is lower than recommended by manufacturer. Maintain this minimum temperature during and after installation of signs. Provide adequate ventilation per adhesive manufacturer's instructions.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within a specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - 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 FABRICATORS

- A. Basis-of-Design Fabricator and Installer: Subject to compliance with requirements, provide Signs of Success, 2350 Skyway Drive, Suite 10, Santa Maria, CA; Phone: 805-925-7545, or comparable by one of the following:
 - 1. Signs Portal, 11640 Hilltop Lane, Lake View Terrace, CA Phone: 213-880-8112.
 - 2. Or approved equal.

2.2 MATERIALS

- A. Basis-of-Design: Rowmark ADA Alternative.
 - 1. Or approved equal.
- B. Single-Ply Impact Modified Acrylic with integral color.
 - 1. Usage: Interior, Exterior and Tactile Signage.
 - 2. Finish: Matte non-glare.
 - 3. IZOD Impact Strength: ASTM D-256, 1.10 ft lbs/in
 - 4. Tensile Strength: ASTM D-638, 5,500 psi to break.
 - 5. Flexural Strength: ASTM D-790 10,300 psi load to outer surface 5%.
 - 6. Rockwell Hardness: ASTM D-785, M45
 - 7. Specific Gravity: ASTM D-792 1.15
 - 8. Deflection Temperature: ASTM D-648 180°F
 - 9. Coefficient of Thermal Expansion: ASTM D-696
 - 10. Vicat Softening Point: ASTM D-1525, 208°F
 - 11. Flammability Rating: UL 94 HB.
 - 12. RoHS compliant (halogen-free), PVC-free, Formaldehyde and Phenol free.

2.3 PANEL SIGNS GENERAL

- A. Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, attachment methods and details of construction. Comply with ADA Accessibility Guidelines (ADAAG) and CBC Sections 11B-216.8 and 11B-703.0
 - 1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally. Ease all edges and radius corners of signs. Saw marks, kerfs, rough or uneven edges are unacceptable. Edges shall be precision machined and visually smooth. All edges shall be painted with polyurethane paint; color as indicated in drawings.
- B. Tactile and Braille Copy: Manufacturer's standard process for producing copy. Comply with the following:
 - 1. Tactile Copy: Produce precisely formed characters, raised 1/32 inch minimum, with square, beveled, or rounded edges free from burrs and cut marks. Provide a minimum of 1/8 inch between two closest points of adjacent tactile characters, measured from the top surface of the characters.
 - 2. Braille: Use rounded or domed California Braille dots per ANSI-117.1 703.5, integral to sign and same color as background, each distinct and separate. DOTS WITH STRAIGHT SIDES AND/OR FLAT TOPS WITH OR WITHOUT EASED EDGES ARE NOT READABLE FOR MANY BRAILLE USERS AND ARE NOT ACCEPTABLE.
- C. Graphic Content and Style: Provide sign copy that complies with requirements indicated for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.
- D. Panel Sign Construction:

1. Solid-Sheet: Non-glare Single-Ply Impact Modified Acrylic with integral color.
 - a. Size: As indicated on Drawings.
 - b. Thickness: 1/8-inch.
 - c. Surface-Applied, Raised Graphics: Applied modified acrylic Characters, Pictograms and Braille.
 - d. Color: As indicated on Drawings.
 2. Sign-Panel Perimeter: Finish edges smooth to be free of blemishes and sharp features.
 - a. Corner Condition in Elevation: Radius as indicated on Drawings.
 3. Text and Typeface: Accessible raised characters as selected by Architect from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color.
 - a. Braille dots indicated on drawings must be domed or rounded.
- E. Acrylic Blank Backer Panels: Same dimensions of sign; mount to second face of glass as required to conceal adhesive and tape. Blank backer panels can be omitted at back-to-back signs mounted on glass.

2.4 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 unless otherwise indicated:
1. Use exposed fasteners except for where signs are indicated to be mounted to glass.
 - a. Material: Furnish stainless steel devices unless indicated otherwise.
 - b. Type: Provide Torx button head tamperproof fasteners and conical anchors as required for substrates shown.
 - c. Predrill holes in signs for through fasteners.
- B. Adhesives: Non-staining and non-sagging, high shear and tensile strength, California VOC compliant. Adhesives shall not embrittle, crack or lose flexibility with exposure to heat. Adhesives shall be used in conjunction with two-face tape.
1. Interior Panel Signs: High-grade clear industrial silicone adhesive as recommended by the adhesive manufacturer for the substrates shown.
 2. Exterior Panel Signs: Heavy-duty exterior grade, moisture and humidity resistant adhesive as recommended by the adhesive manufacturer for the substrates shown. Provide one of the following, or approved equal:
 - a. OSI Sealants, Inc., PL 400 VOC.
 - b. Simpson Strong-Tie Anchor Systems, Epoxy-Tie SET.
 - c. Macco, Liquid Nails Ultra Duty Poly LN-950.

- C. Two-Face Tape: High-bond, double-coated foam-core tape with PE film liner and modified acrylic adhesive on both sides.

- 1. Basis-of-Design Product: 3M VHB Tape 5962 or approved equal.
- 2. Color: Black.
- 3. Width: ½-inch.

2.5 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. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring the exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
- 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
- 5. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
- 6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

- B. Engraving Method: Laser, Rotating Carbide.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 CODE REQUIREMENTS FOR PANEL SIGNS

- A. Finish and Contrast: Characters, symbols and their background shall have a nonglare finish. Characters and symbols shall contrast with their background, either light on a dark background or dark on a light background.
- B. Proportions: Raised characters on signs shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the

uppercase letter "I." Stroke thickness of the uppercase letter "I" shall be 10 percent minimum and 20 percent maximum of the height of the character.

- C. Character Height: Raised characters shall be a minimum of 5/8 inches and a maximum of 2 inches high.
1. Height from finish floor from baseline of character: 40 to ≤ 70 inches:
 - a. Horizontal viewing distance < 72 inches from finish floor: 5/8 inch minimum.
 - b. Horizontal viewing distance ≥ 72 inches: 5/8-inch plus 1/8 inch per foot of viewing distance above 72 inches.
 2. Height from finish floor from baseline of character > 70 to ≤ 120 inches:
 - a. Horizontal viewing distance < 180 inches from finish floor: 2 inches.
 - b. Horizontal viewing distance ≥ 180 inches from finish floor: 2-inches plus 1/8 inch per foot of viewing distance above 180 inches.
 3. Height from finish floor from baseline of character > 120 inches:
 - a. Horizontal viewing distance < 21 feet from finish floor: 3 inches.
 - b. Horizontal viewing distance ≥ 21 feet from finish floor: 3-inches plus 1/8 inch per foot of viewing distance above 21 feet.
- D. Raised Characters and Pictorial Symbol Signs: When raised characters are required or when pictorial symbols (pictograms) are used on such signs, they shall conform to the following requirements:
1. Character Type. Characters on signs shall be raised 1/32 inch minimum and shall be sans serif uppercase characters accompanied by contracted (Grade 2) Braille complying with CBC Section 11B-703.3.
 2. Character Size. Raised characters shall be a minimum of 5/8 inch and a maximum of 2 inches high.
 3. Pictorial Symbol Signs (Pictograms). Pictorial symbol signs (pictograms) shall be accompanied by the verbal description placed directly below the pictogram. The outside dimension of the pictogram field shall be a minimum of 6 inches in height.
 4. Character Placement. Characters and Braille shall be in a horizontal format. Braille shall be placed a minimum of 3/8 inch and a maximum of 1/2 inch directly below the tactile characters; flush left or centered. When tactile text is multi-lined, all Braille shall be placed together below all lines of tactile text.
 5. Proportions: Raised characters on signs shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase letter "I." Stroke thickness of the uppercase letter "I" shall be 15 percent maximum of the height of the character.
- E. Braille: Contracted (Grade 2) Braille shall be used wherever Braille is required. Dots shall be 1/10 inch on center in each cell with 2/10-inch space between cells, measured from the second column

of dots in the first cell to the first column of dots in the second cell. Dots shall be raised a minimum of 1/40 inch above the background. Braille dots shall be domed or rounded.

- F. Mounting Location and Height: Where permanent identification signs are provided for rooms and spaces, signs shall be installed on the wall adjacent to the latch side of the door. Where there is no wall space on the latch side, including at double leaf doors, signs shall be placed on the nearest adjacent wall, preferably on the right.
 - 1. Where permanent identification signage is provided for rooms and spaces, they shall be located on the approach side of the door as one enters the room or space. Signs that identify exits shall be located on the approach side of the door as one exits the room or space.
 - 2. Signs with raised characters and Braille shall be located 48 inches minimum above the finish floor or ground surface, measured from the baseline of the lowest line of Braille and 60 inches maximum above the finish floor or ground surface, measured from the baseline of the highest line of raised characters. Mounting location shall be determined so that a person may approach within 3 inches of signage without encountering protruding objects or standing within the swing of a door.
- G. Inspection: Tactile signs shall be field inspected for compliance after installation (CBC 11B-703.1.12)

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. Notify owner in writing of unacceptable substrates or detrimental conditions.
- 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. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of installation means that the installer accepts substrates and surfaces.

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.
- B. Accessible Signage: Install in locations on walls as indicated on Drawings and according to the accessibility standard.

C. Mounting Methods:

1. Visible Attachment with 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. Concealed Attachment with Adhesive and Two-Face Tape (Signs Mounted on Glass):
 - a. Clean bond-breaking materials from substrate surface and remove loose debris.
 - b. Apply tape strips continuously around entire perimeter of panel. Keep strips away from edges to prevent visibility at sign edges.
 - c. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges.
 - d. Place sign in position and push to engage tape and adhesive.
 - e. Install panel sign per schedule or blank panel sign of matching sign material and finish onto opposite side of glass to conceal back of sign, adhesive and two-face tape.
3. Alternate Concealed Attachment with Adhesive and Two-Face Tape Mounted on Glass:
 - a. Clean bond-breaking materials from substrate surface and remove loose debris.
 - b. Apply tape strips continuously around entire perimeter of panel. Keep strips away from edges to prevent visibility at sign edges.
 - c. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position and push to engage tape and adhesive.
 - d. Provide panel sign per schedule or blank panel sign of matching sign material and finish onto opposite side of glass to conceal back of sign, adhesive and two-face tape.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

3.4 SCHEDULES

A. Message Schedule: See Signage Message Schedules on Drawings.

1. Note text in message schedules is provided for bidding purposes only; final verification will take place during submittal review.

END OF SECTION 101423

SECTION 101426 - POST AND 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. Nonilluminated post-and-panel signs.
 - 2. Nonilluminated panel signs mounted on fencing or structures.

- B. Related Requirements:

- 1. Section 015000 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary informational and directional signs.
 - 2. Section 033000 "Cast-in-Place Concrete" for concrete foundations, concrete fill in postholes, and setting anchor bolts in concrete foundations for signs.
 - 3. Section 101423 "Panel Signage" for wall-mounted sign panels.

1.3 COORDINATION

- A. Furnish templates and tolerance information for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

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

- B. Shop Drawings: For signage.

- 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

- C. Product Schedule: For post-and-panel and pylon signs. Use same designations indicated on Drawings or specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - 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 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] <Insert temperature change>.
- B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and the California Building Code Chapter 11B.

2.2 POST-AND-PANEL SIGNS

- A. Post-and-Panel Signs: Sign of single-panel configuration; with smooth, uniform surfaces and support assembly; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Solid-Sheet Sign Panels: Aluminum sheet with finish specified in "Sign-Panel-Face Finish and Applied Graphics" Subparagraph and as follows:
 - a. Thickness: 0.125 inch.
 - b. Surface-Applied Graphics: Applied baked enamel or powder coat or paint.

2. Posts: Steel.
 - a. Shape: Round.
 - b. Size: 2-inch diameter.
 - c. Installation Method: Direct burial.
 - d. Finish and Color: Galvanized Steel.
3. Sign-Panel-Face Finish and Applied Graphics:
 - a. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in color as indicated by manufacturer's designation.
 - b. Painted Finish and Graphics: Manufacturer's standard, factory-applied exterior-grade sign paint or acrylic polyurethane, in color as indicated by manufacturer's designation.
 - c. Overcoat: Manufacturer's standard baked-on clear coating.
4. Text and Typeface: Typeface as selected by Architect from manufacturer's full range and variable content as scheduled.

2.3 MATERIALS

- A. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Steel Materials:
 1. Steel Tubing or Pipe: ASTM A500/A500M, Grade B.
 2. Bolts for Steel Framing: ASTM A307 or ASTM F3125/F3125M, Grade A325 as necessary for design loads and connection details.
- C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 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 unless otherwise indicated:
 1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. For exterior exposure, furnish stainless-steel or hot-dip galvanized devices unless otherwise indicated.
 3. Exposed Metal-Fastener Components, General:
 - a. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant, Allen-head slots unless otherwise indicated.

B. Anchoring Materials:

1. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
2. 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.
 - a. 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.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
- B. Sign Message Panels: Construct sign-panel surfaces to be smooth and to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.
 1. Increase panel thickness or reinforce with concealed stiffeners or backing materials as needed to produce surfaces without distortion, buckles, warp, or other surface deformations.
- C. Post Fabrication: Fabricate posts designed for structural performance indicated and of lengths required for installation method indicated for each sign.
 1. Steel Posts: Fabricate from minimum 0.120-inch-thick, steel tubing unless otherwise indicated. Include post caps, fillers, spacers, junction boxes, access panels, reinforcement where required for loading conditions, and related accessories required for complete installation.
 - a. Hot-dip galvanize post assemblies after fabrication according to ASTM A123/A123M.
 2. Direct Burial: Fabricate posts 36 inches longer than height of sign to permit direct burial or embedment in concrete foundations or concrete-filled postholes.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

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

3.2 INSTALLATION

- A. General: Install signs using installation methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, 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 components 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.

3.3 INSTALLING POSTS

- A. Vertical Tolerance: Set posts plumb within a tolerance of 1/16 inch in 3 feet.
- B. Direct-Burial Method:
 - 1. Excavation: Excavate posthole to dimensions indicated. Reconstruct subgrade that is not firm, undisturbed, or compacted soil, or that is damaged by freezing temperatures, frost, rain, accumulated water, or construction activities by excavating an additional 12 inches, backfilling with satisfactory soil or well-graded aggregate, and compacting to original subgrade elevation.
 - 2. Setting in Cast-in-Place Concrete: Set post in position, support to prevent movement, and place concrete in posthole as indicated on Drawings.
 - a. Leave anchorage joint exposed with 1/8-inch anchoring material sloped away from post.

3.4 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101426

SECTION 102800 - TOILET 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. Furnish and install the following:
 - a. Toilet room accessories.
 - b. Plumbing fixture pipe protection.
 - c. Custodial accessories

- B. Related Sections:

- 1. Section 061000 "Rough Carpentry." In-wall framing and plates for support of accessories, placement of concealed anchor devices and placing of backing plate reinforcement.
 - 2. Section 092900 "Gypsum Board."
 - 3. Section 093013 "Ceramic Tiling." Tile materials and mounting beds.
 - 4. Division 22 "Plumbing".

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.

- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room 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 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, but are not limited to, visible silver spoilage defects.
 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Design accessories and fasteners to comply with the following requirements:
 1. Grab Bars: Installed units able to resist 250 lbf concentrated load applied in any direction and at any point.

2.2 TOILET ROOM ACCESSORIES

- A. Manufacturers: Unless noted otherwise, Specification is based on products by Bobrick Washroom Accessories. Subject to compliance with requirements, approved accessories by one of the following may be used:
 1. A & J Washroom Accessories.
 2. American Specialties, Inc.
 3. Bradley Corp.
- B. Grab Bars (**GB-36 and GB-42**):
 1. Basis-of-Design Product: Bobrick B-6806 Series.
 2. Capacity: Designed to support 900 lbs in compliant installations.
 3. Description: Grab bar with 90 degree return to flange. Clearance between grab bar and finished wall is 1-1/2 inches.
 4. Grab Bar Materials: 18-8, Type 304, 18 gauge stainless steel tubing with satin finish, ends of grab bar pass through flanges and are heliarc welded to flanges to form one structural unit, outside diameter 1-1/2 inches (38mm).
 5. Mounting Flanges: Concealed, 18-8, Type 304, 1/8 inch thick, stainless steel plate.

- a. End Flanges: 2 inches x 3-1/8 inches with two holes for attachment to wall.
 - 6. Snap Flange Covers: 18-8, Type 304, 22 gauge drawn stainless steel with satin finish, 3-1/4 inch diameter x 1/2 inches deep; snap over mounting flange to conceal mounting screws.
 - 7. Configuration and Length: As indicated on Drawings.
- C. Mirror Units **(M-1836)**:
- 1. Basis of Design Product: Bobrick B-290.
 - 2. Mirror: 1/4 inch tempered glass, electrolytically copper-plated.
 - 3. Frame: One-piece roll-formed frame, 18-8 Type 304 stainless steel angle with satin finish.
 - 4. Frame Corners: Heliarc welded, ground and polished smooth.
 - 5. Attachment: Secured to concealed wall hanger with theft-resistant locking device.
- D. Surface Mount Paper Towel Dispenser for Roll Paper Towels **(PTD-2)**:
- 1. Basis-of-Design Product: San Jamar Classic Simplicity Essence
 - 2. Product Code: T7400TBK
 - 3. Surface-Mounted Paper Towel Dispenser for 8" wide roll x 8" diameter, touch-free towel dispensing.
 - 4. Dimensions: 15.1 inches x 12.40 inches x 9.30 inches (H x W x D).
 - 5. Material and Finish: Break-resistant plastic, Transparent Black Pearl
- E. Surface Mount Seat Cover Dispenser **(SCD-2)**:
- 1. Basis-of-Design Product: Impact Products Rest Assured
 - 2. Item Number: 25131900.
 - 3. Surface Mounted 1/2 Fold Seat Cover Dispenser.
 - 4. Dimensions: 11.30 inches x 16.05 inches x 3.15 inches (H x W x D).
 - 5. Material and Finish: Smoke Gray Plastic
- F. Surface Mount Soap Dispenser **(SD-2)**:
- 1. Basis-of-Design: Buckeye International – Stealth Dispenser
 - 2. Surface Mounted Soap Dispenser; 1250 ml capacity.
 - 3. Dimensions: 10.19 inches x 5.42 inches x 5.43 inches (H x W x D).
 - 4. Material and Finish: Black Plastic
- G. Sanitary Napkin Receptacles **(SNR-1)**:
- 1. Basis-of-Design Product: Bobrick ClassicSeries® B-353.
 - 2. Mounting: Recessed.
 - 3. Door or Cover: Self-closing, disposal-opening cover and full-length piano-type hinged face panel with tumbler lockset.
 - 4. Receptacle: Removable.
 - 5. Material and Finish: Stainless steel, No. 4 finish (satin).

H. Sanitary Napkin/Tampon Vendors (SNV-1):

1. Basis-of-Design Product: Bobrick ClassicSeries® Model B-3706C.
2. Type: Sanitary napkin and tampon.
3. Mounting: Fully recessed, designed for 6-inch wall depth or semi-recessed, designed for 4-inch to 6-inch wall depth.
4. Minimum Capacity: 20 napkins and 30 tampons.
5. Operation: No coin (free).
6. Exposed Material and Finish: Stainless steel, No. 4 finish (satin).
7. Lockset: Tumbler type with separate lock and key for coin box.

I. ADA Recessed Multi-Roll Toilet Tissue Dispenser (TTD-3):

1. Basis-of-Design Product: Bobrick TrimLineSeries® B-35883.
2. Description: Unit dispenses two standard-core toilet tissue rolls up to 5-1/4 inch diameter.
3. Mounting: Recessed (3-inch maximum projection from wall).
4. Cabinet: 18-8, Type 304, 22-gauge stainless steel. All-welded construction.
5. Door: 18-8, Type 304, 20-gauge stainless steel, with satin finish; 9/16 inch 90 degree return edges; secured to cabinet with two rivets. Equipped with a tumbler lock keyed like other Bobrick washroom accessories.
6. Hinge: Concealed, full-length stainless steel piano-hinge.
7. Spindle: 18-8, Type 304, 18-gauge; theft-resistant, spindles retained in dispensing mechanism when door is locked.

J. Utility Hook (UHK-1):

1. Basis-of-Design Product: Bobrick Model B-6707.
2. Description: Surface-mount utility hook.
3. Flange and Support Arm: 18-8, Type 304, 22-gauge stainless steel with concealed 16-gauge stainless steel mounting bracket. All-welded construction. Secures to wall plate with a stainless steel setscrew.
4. Concealed Wall Plate: 18-8, Type 304, 16-gauge stainless steel.
5. Cap: 18-8, Type 304, 10-gauge stainless steel. Welded to support arm.
6. Finish: No. 4 finish (satin).

2.3 PLUMBING FIXTURE PIPE PROTECTION**A. Source Limitations: Obtain pipe protection units from single source from single manufacturer.****B. Under-Lavatory Piping Protection (PP-1):**

1. Basis-of-Design Product: IPS Corporation, Truebro Lav Shield Model 2018-AS-L.
2. Description: Protective lavatory enclosure for supply and drain piping assemblies that prevents direct contact with and burns from piping.
3. Fit: Custom factory pre-cut model as required to match lavatory model.
4. Material and Finish: Antimicrobial, rigid high-impact, stain-resistant PVC, white.

C. Under Sink Piping Protection **(PP-2)**:

1. Basis-of-Design Product: IPS Corporation, Truebro Lav Guard 2 Fast Fit Undersink Piping Cover Model 101E-Z.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.4 CUSTODIAL ACCESSORIES

A. Manufacturers: Unless noted otherwise, Specification is based on products by Bobrick Washroom Accessories. Subject to compliance with requirements, approved accessories by one of the following may be used:

1. A & J Washroom Accessories.
2. American Specialties, Inc.
3. Bradley Corp.

B. Custodial Mop and Broom Holder **(MR-1)**:

1. Basis-of-Design Product: Bobrick Model B-223x24.
2. Description: Surface-mounted unit with mop and broom holders.
3. Length: 24 inches.
4. Mop/Broom Holders: Three spring-loaded, rubber hat, cam type.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

2.5 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- E. 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.
- F. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

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 Owner's representative.

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.
 - 1. Remove temporary labels and protective coatings.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 102800

SECTION 104400 - FIRE PROTECTION SPECIALTIES**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. Portable, hand-carried fire extinguishers and mounting brackets.
- B. Related Sections:
 - 1. Section 061000 "Rough Carpentry" for framed openings for recessed fire extinguisher cabinets.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For each type of portable fire extinguisher. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
 - 2. For each type of fire protection cabinet: Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing semi-recessed mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
- C. Product Schedule: For fire extinguishers and fire-protection cabinets. Indicate whether recessed, semi-recessed, or surface mounted. Coordinate final fire-protection cabinets with fire-extinguishers to ensure proper fit and function.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty for fire extinguishers.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1. Include test, refill or recharge schedules, procedures, and re-certification requirements including requirements applicable to the Work.

1.6 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.

1.7 WARRANTY

- A. Special Warranty for Fire Extinguishers: 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, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
 - b. Faulty operation of valves or release levers.
 2. Warranty Period: Six 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.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
- B. Basis-of-Design: Where shown on the drawings, provide fire extinguishers, cabinets, accessories as manufactured by J. L. Industries, Inc., a division of Activar Construction Products Group, or approved equal from one of the following:
 1. Larsen's Manufacturing Co.
 2. Potter Roemer LLC.

2.3 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Valves: Manufacturer's standard.
 - 2. Handles and Levers: Manufacturer's standard.
 - 3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Multipurpose Dry-Chemical Type in Steel Container: Activar Cosmic 5X FE05XA, UL-rated 2A-10B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.
- C. Mounting Brackets: JL Industries MB818C.

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. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF FIRE EXTINGUISHERS AND MOUNTING BRACKETS.

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: Top of fire extinguisher to be at 48 inches maximum above finished floor.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104400

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SECTION #210000**Fire Protection****PART 1 – GENERAL****1.01 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.

1.02 DESCRIPTION:

A. Scope of Work:

1. Work included: Furnish all labor, equipment, appurtenances and material necessary to perform all operations in connection with the installation of a wet pipe type fire sprinkler system(s) as indicated on the drawings and as required by the 2022 California Building Code including 2022 NFPA #13 as amended by Chapter 35 of the 2022 California Building Code. The work shall include but not be limited to the following:
 - a. Fire underground piping within 5 feet of the building.
 - b. Supply mains, risers, valves and drains.
 - c. Water flow, Bell, and tamper switches at building as required.
 - d. Wet pipe hydraulically designed fire sprinkler system per plans.
 - e. Coordination with all trades prior to fabrication and installation.
 - f. Provide As-Built fire sprinkler shop drawings, for approval, for any changes to the approved documents.
2. Related work in other sections:
 - a. Electrical connections and wiring for alarm tamper and water flow switches.
 - b. Central station monitoring.
 - c. Painting, see painting section.
 - d. Backflow prevention valve, Primary Control Valve, Check Valve and Fire Department Connections: see site utility plan and specifications.
 - e. Valve tamper switches for valves in item d, above.

B. Quality Assurance:

1. All equipment shall be new and in good condition.
2. Similar equipment shall be by one manufacturer.
3. All equipment shall be listed by Underwriter's Laboratories or Factory Mutual approved as required by NFPA.

C. Submittals:

1. All substitutions shall be approved prior to installation.
2. Calculations: The system is hydraulically designed in accordance with NFPA #13 standards as follows:

- a. Restrooms, Dwellings, Offices, Unused Attics, Corridors, Canopies – **Light Hazard.**
- b. Kitchen, Library (except large stack) - **Ordinary Hazard Group I**
- c. Work room, Electrical, Storage, Mech rooms – **Ordinary Hazard Group II**

D. Product Delivery, Storage and Handling:

- 1. Delivery of products (materials): All products and/or materials necessary for the construction of the fire protection system shall be delivered to the job site in a timely manner so that the installation of the work will conform to the project schedule.
- 2. Storage of materials: Materials stored on the jobsite shall be done so with the approval of the Project Superintendent.
- 3. Handling of materials: All materials shall be handled in accordance with the instructions of the manufacturer.

E. Guarantee:

- 1. Contractor shall submit with guarantee stating that the work shall be guaranteed against any defects in material and/or workmanship for a period of one (1) year from date of Notice of Completion and defective work which develops during guarantee period shall be repaired and/or replaced at no additional cost to the owner.

2.01 PRODUCTS:

A. Fire Protection Piping-Interior:

- 1. Pipe: Welded or grooved piping – ASTM A-53 Sch. 10 pipe or UL/FM listed fire sprinkler pipe.
- 2. Threaded piping – ASTM A-53 Sch. 40 or UL/FM listed fire sprinkler pipe.
- 3. Plastic Pipe – UL/FM Listed CPVC fire sprinkler pipe.
- 4. Threaded Fittings: AnvilStar ductile iron screwed, 125 lb class or equal.
- 5. Grooved Fittings: Victaulic grooved fittings with rigid and flexible groove couplings as required or equal.
- 6. Welded Fittings: AnvilStar weld outlet fittings for all pressure ratings or equal.
- 7. Mechanical Fittings: AnvilStar UL/FM mechanical type fittings or equal.
- 8. Plastic Fittings: UL/FM Listed CPVC fittings.

B. Water Flow Indicator Switches:

- 1. Provide at locations where required and shown on plans.
- 2. Indicators shall be U/L and CSFM listed.
- 3. Manufacturer: Potter, Notifier or equal.

C. Electric Bell:

- 1. Provide at locations where required and shown on plans.
- 2. Notification device shall be U/L and CSFM listed.
- 3. Manufacturer: Potter, Notifier or equal.

D. Valve Tamper Switches:

1. Provide at locations where required and shown on drawings.
2. Indicators shall be U/L and CSFM listed.
3. Manufacturer: Potter, Notifier or equal.

E. Sprinkler Heads:

1. Manufacturer: Sprinkler heads shall be as shown on plans.
 - i. Finish: as indicated on plan.

3.01 EXECUTION:**A. Inspections:**

1. System Acceptance shall be in conformance with 2022 NFPA #13, Chapter 24.
2. Witness: All tests shall be witnessed by the Inspector of Record. A minimum of 48 hour's notice is required.

B. Installation:

1. Prior to fabrication, all building and piping measurements must be verified in the field.
2. Piping is to be installed in accordance with the approved fire sprinkler plans, any adjustments made for field conditions must be approved prior to proceeding with installation.
3. Signs: Furnish and install automatic sprinkler industry signs indicating location of control valves, drain valves and test valves.
4. Seismic bracing: Furnish and install earthquake protection for sprinkler system in accordance with 2022 NFPA #13.
5. Restraints: Furnish and install in accordance with 2022 NFPA #13.
6. Provide Operations and Maintenance Manuals in accordance with 2022 NFPA #13.
7. Sprinkler heads shall be aligned with ceiling components.

C. Adjusting and Cleaning:

1. Appurtenances and equipment shall be left in a clean, neat condition.
2. Adjust all timing devices in conjunction with the alarm contractor to ensure proper operation. Actual field testing of timing switches shall be required.
3. Exposed piping shall be left in a clean and neat condition.

END OF SECTION #

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SECTION 220000 - PLUMBING**PART 1 - GENERAL****1.1 DESCRIPTION****A. Related Documents:**

1. The other Contract Documents complement the requirements of this Section and apply to this Section
2. Division 1 - General Requirements, Sections 220500 apply to the Work of this Section.
3. Where requirements of this Section exceed those in other Contract Documents, Contractor shall comply with the requirements of this Section.

B. Codes and Regulations:

1. California Plumbing Code (CPC).
2. California Mechanical Code (CMC).
3. California Building Code (CBC).
4. California Green Building Standards Code(CGBSC).
5. California Electrical Code (CEC).
6. California Fire Code (CFC).
7. National Fire Code (NFC).
8. National Fire Protection Association (NFPA).
9. Local Building Department.
10. Local Fire Marshal.
11. Office of the State Fire Marshall.
12. Division of the State Architect.
13. California Energy Code (CEnC).
14. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirements will govern when so directed by the Architect.

C. Scope of Work: (Plumbing Section Division 22)

1. Material and labor including rough-in for and connection to fixtures, appliances and equipment are:
 - a. WASTE AND VENT
 1. Drain waste and vent piping (DWV)
 2. Indirect waste piping

3. Floor drains.
4. Traps.
5. Vent flashings.
6. Insulation of piping for condensation, heat, sound, and vibration.
- b. STORM AND SUB-SOIL DRAINAGE
 1. Roof and overflow drains, including flashing, rainwater drainage piping.
- c. WATER
 1. Potable water piping systems including water hammer arrestors.
 2. Isolation, Zone and Control Valves.
 3. Hot water systems including heaters and storage tanks.
 4. Tempered water systems.
 5. Piping for water service.
 6. Backflow preventers.
 7. Disinfecting water systems.
 8. Insulation of piping and equipment for heat, sound, and vibration.
- d. ALL PLUMBING FIXTURES AND SUPPORTS
 1. Including, but not limited to:
 - (a) Sinks, lavatories, water closets, urinals, service sinks, etc., - all materials
 - (b) Supports (backing) for all plumbing fixtures and accessories.
 - (c) Installation of sinks in or part of drainboards - all materials
- e. PIPE IDENTIFICATION – Refer to Section 220500
- f. CONNECTIONS
 1. Utilities-Sanitary sewer, storm drain, water.
 2. Make-up water for heating and cooling systems
 3. Hot water tanks
 4. Temporary water, waste lines
 5. The joining of pipe by any mode or method including, but not limited to, acetylene and arc welding, brazing, lead burning, plastics welding, soldering, wiped joints, caulked joints expanded or rolled joints, etc., used in connection with any of the work listed herein.
- g. LAYOUT AND CUTTING

1. Holes, chases, channels, the setting and erection of bolts, inserts, stands, brackets, stanchions, supports, sleeves, escutcheon plates, thimbles, hangers, conduits, and boxes.
- h. EXCAVATION, TRENCHING AND BACKFILL
 1. In connection with plumbing and piping work shown herein
- i. TEMPORARY PIPING in connection with:
 1. Building and construction work
 2. Excavating and underground construction
- j. PIPE HANGERS, SUPPORTS, ANCHORS, GUIDES, EXPANSION JOINTS
 1. Including:
 - (a) Supports for equipment to which pipe is connected, such as tank supports
 - (b) Acoustical pipe isolation
 - (c) Isolators-dielectric and vibration
 - (d) Anchors and thrust blocks of concrete, metal, etc.
 - (e) Seismic bracing
 - (1) Anvil/Badger, Mason Industries, B-Line/TOLCO or approved equal.
 - (2) Seismic hanger system design shall comply with current CBC requirements and ASE 7-05 and 7-10.
- k. SIGNS AND NOTICES
- l. ROOF FLASHINGS FOR PIPING PENETRATIONS
- m. TESTS
 1. Piping, for tightness
 2. Equipment for performance
 3. Operating instructions
 4. Final operation

1.2 ACCESSIBLE PLUMBING FIXTURES

- A. Accessible plumbing fixtures shall comply with all of the requirements of CBC Sections 11B-213, 11B-305, & 11B-308, & 11B-Division 6.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.
- B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the Work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.
- C. Comply with NSF 14, "Plastics Piping System Components and Related Materials," for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.
- D. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.
- E. Comply with NSF 372, "Drinking Water System Components – Lead Content" for potable domestic water piping and components.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of Architectural Division 1 Sections.
- B. If the water heating equipment is substituted with a different brand and energy factor than that specified on the Drawings, the Title 24 Energy Compliance Calculation may have to be re-run. This re-calculation is NOT to be considered a general CA Task and will be billed hourly (6 hr minimum) as an Additional Service at the current rate defined in Exhibit B for Senior Energy Analyst.
- C. Product Data: Within 35 calendar days after the Contractor has received the Notice to Proceed, submit 1 electronic PDF copy of the following to the Architect for approval prior to acquisition:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications, catalog cuts, and other data needed to prove compliance with the specified requirements. All pieces of equipment shall be clearly identified on corresponding manufacturer's literature being submitted.
 - 3. Shop Drawings or other data as required to indicate method of installing and attaching equipment, except where such details are fully shown on the Drawings.
 - 4. Submittals for the entire project shall be submitted at the same time or may be rejected until all are included in one submittal package.
 - 5. Submittals shall be provided electronically in PDF format, bookmarked by design tags for equipment and specification sections for materials. Incomplete or noncompliant submittals may be rejected.

1.5 DESIGN CHANGES CAUSED BY PRODUCT SUBSTITUTIONS

- A. The contractor shall pay the costs of design and installation for changes resulting from the substitution of alternate products.
- B. Acceptance of alternate products by Architect does not change this requirement.

1.6 PRODUCT HANDLING

- A. Comply with pertinent provisions of Architectural Sections.
- B. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

PART 2 - PRODUCTS

2.1 WASTE, VENT, SEWER AND STORM DRAINAGE

A. Above Grade

- 1. All waste, vent, sewer and storm lines shall be of cast iron soil pipe and fittings and shall be NSF Certified to conform to the requirements of CISPI Standard 301, ASTM A-888, latest edition or ASTM A-74 for all pipe and fittings. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and be listed by NSF International, indicate the manufacturer's name, country of origin, and date of manufacture, or receive prior approval of the engineer.

a. Acceptable Manufacturers:

- 1. AB&I Foundry
- 2. Charlotte Pipe and Foundry
- 3. Tyler Pipe Company

b. Couplings

- 1. Standard Couplings: for hubless pipe and fittings shall conform to the manufacturer's installation instructions and local code requirements. Hubless couplings shall comply with ASTM Standard C1277 and CISPI 310 and be listed by NSF International.

(a) Acceptable Manufacturers:

- (1) Anaco
- (2) AB&I
- (3) Tyler

c. Mandatory Referenced Standards

- 1. Cast Iron Soil Pipe Institute Standard Specifications - Latest Issue
 - (a) CISPI 301: Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

- (b) CISPI 310: Couplings for use in connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

2. ASTM Standard Specifications - Latest Issue

- (a) A-888: Standard Specifications for Hubless Cast Iron Soil Pipe and Fittings.
- (b) C-564: Standard Specifications for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- (c) C-1277 Standard Specifications for Shielded Couplings for Cast Iron Soil Pipe & Fittings.
- (d) C-1540 Standard Specification for Heavy Duty Couplings for Cast Iron Soil Pipe & Fittings.

B. Below Grade:

- 1. Schedule 40 Solid wall PVC plastic DWV pipe with solvent-cemented drainage pattern fittings complying with ASTM D 1785 - Latest Issue.
 - a. SCH. 40 Cellular Core PVC plastic DWV pipe with solvent-cemented drainage pattern fittings complying with ASTM D 4396 may be used at Contractor's option for vent piping. -Latest Issue.
- 2. Schedule 40 Solid wall ABS plastic DWV pipe with solvent-cemented fittings complying with ASTM D-2661 - Latest Issue.
 - a. SCH. 40 Cellular Core ABS plastic DWV pipe with solvent-cemented drainage pattern fittings complying with ASTM D 3965 may be used at Contractor's option for vent piping. -Latest Issue.

C. Condensate (sized per CMC) and indirect waste drains

- 1. Type M Copper Water Tube ASTM B88 with wrought Copper solder fittings, ANSI-B16.22

2.2 DOMESTIC WATER PIPING

A. Below Grade (Water Service)

- 1. 3" NPS and smaller, Schedule 40 PVC Plastic Pipe and fittings. ASTM D1785, D2466, with Solvent Cement Joints ASTM D2564.
- 2. 2" NPS and smaller, Type K Soft Annealed Temper Copper Tube ASTM B88 with Wrought Copper pressure fittings, ANSI B16.22. SIL-FOS - High temperature Brazing Metal Filler.

B. Above Grade (Distribution System)

- 1. Piping
 - a. For soldered, brazed and mechanical joints, 4" and smaller Copper Water Tube Type L Annealed Temper (Hard Drawn) ASTM B75 or ASTM B88.

2. Fittings

- a. Wrought Copper Pressure Solder Fittings, ASME B16.22 or ASME B16-25, 95-5 Tin-Antimony Filler Metal.
- b. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- c. Copper Unions: MSS SP-123, cast-copper alloy, hexagonal-stock body, with ball-and-socket, met-to-metal seating surfaces, and solder-joint or threaded ends.
- d. Press Fitting: Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM. Press fittings shall have an inboard bead design.
 1. Copper Press Fittings: Viega/Rigid Tool Company, NIBCO, Elkhart/Apollo Xpress or approved equal.
 2. 2"NPS and smaller: Wrought copper fitting with EPDM-rubber O-ring seal in each end.
 3. 2-1/2" to 4"NPS: Cast-bronze or wrought copper fitting with EPDM-rubber O-ring seal in each end.
- e. All underground water piping within the building boundaries shall be ASTM B88-93a Type "L" annealed (soft) copper tube made up without fittings below the floor level.

2.3 VALVES

- A. Acceptable Manufacturers: Victaulic Milwaukee, Hammond, Jomar, NIBCO, others as noted.

Type	Size Range	Part Number
Ball	2" and smaller (2 piece)	Milwaukee UPBA400 Hammond UP8301A NIBCO 585-80-LF Victaulic Series P569

- B. All valves in copper piping shall be soldered in or have screwed threads. Copper-tube dimensioned grooved joints are acceptable for 2-1/2" and larger sizes. Threaded valves shall be installed with sweat to screwed adapters.
- C. Valves used on potable water services shall be UL classified in accordance with NSF-61 and meet the low-lead requirements of NSF-372.
- D. All valves to be in accordance with District standards.

2.4 HANGERS AND SUPPORTS

- A. In general, all pipe hangers and supports shall conform to the following except where special pipe hangers and supports are detailed on the Drawings. In all cases hanger and support details on the Drawings shall take precedent over the following:

Piping 6" Size and smaller:

<u>Items</u>	<u>TOLCO Figure</u>	<u>Anvil</u>
Pipe Hanger	1; 2; 200	260
Side Beam Clamp for Wood Joist	58	207
Beam Coupling for Steel Beams	65	92
Rod Coupling for Connection to "Hilti"	70	135
Inserts in Concrete Decks	107;109A;109AF	N/A
Trapeze Hangers	Tolstruct A12	AS200
Pipe Clamp	TOLCO Cush Clamp	AS004OD-AS098OD

B. Similar items by HOLDRITE, Anvil International, Erico-Caddy or TOLCO/B-Line will be acceptable.

C. Hanger Rods shall conform to the following table:

<u>Tube/Pipe Size</u>	<u>Rod Diameter</u>
1/2" to 4"	3/8"
5" to 8"	1/2"

D. Trapeze hangers may be used where parallel runs of pipe occur. All rods on trapeze hangers shall be 1/2" minimum size.

E. Hanger Support Spacing shall be as follows unless shown otherwise on the Drawings:

1. Horizontal:

- Cast Iron: Every other joint unless over 4 feet, then at every joint.
- Copper: Every 6 feet for 1-1/2 inch and smaller, and 10 feet for 2 inch and larger.

2. Vertical:

- Cast Iron: Base and every floor not to exceed 15 feet.
- Copper: Every floor not to exceed 10 feet.

F. Refer to the plumbing code for materials not listed above.

G. At all points where insulated pipe contacts a hanger or support, the point of contact shall be protected by a metal insulation pipe shield #B3153 as manufactured by B-Line. Equivalent pipe protectors will be considered provided the substitute item meets the same standard of quality and performance as the specified item.

H. Abrasion-Protection Isolators: Use for prevention of damage to tubes and piping caused by abrasion when passing through or in contact with studs, joists, and similar framing.

1. Products:

- HOLDRITE #200 Series Isolators and Clamps.

I. Dissimilar Metal Isolators: Use for prevention of damage to tubes and pipes caused by contact between dissimilar metals.

1. Products:

- a. HOLDRITE #200 Series Isolators and Clamps.
- J. Acoustic Noise & Vibration Isolation System: Consisting of through-stud isolators, pipe clamps, riser clamp pads, neoprene and felt lining material and associated support brackets. For applications requiring acoustical isolation of tubing, piping, and equipment from structure.
 - 1. Products:
 - a. HOLDRITE Silencer System with HOLDRITE STOUT Bracket System.
- K. Seismic Restraint Devices
 - 1. Available Manufacturers:
 - a. Anvil/Badger
 - b. Mason Industries
 - c. B-Line Tolco Division of Eaton
 - 2. Seismic hanger system design shall meet the requirements of IBC, CBC and ASCE 7-05 and 7-10.

2.5 WALL AND FLOOR PENETRATIONS

- A. Fire walls and floors:
 - 1. Wall and floor penetrations shall be protected with a U.L. approved fire rated system. The system shall be per the Drawing Details, or other manufacturer's installation instructions.
 - 2. Fire stopping materials by Hilti, Metacaulk, or 3M are considered equal. The material shall be the same as called out for in the U.L. approved system.
- B. Poured concrete walls and floors.
 - 1. Pipes penetrating poured concrete walls and floors shall be protected by providing the following:
 - a. A Schedule 40 PVC sleeve one (1) size larger than the pipe or one quarter (1/4) inch of foam material wrapped around and secured to the pipe or packed and caulked with mineral wool.
 - b. Protection shall end flush with the wall or floor surface.
- C. All walls and floors:
 - 1. Piping passing through walls and floors exposed to view shall be provided with chrome plated split-ring escutcheon plates in finished areas. Brass or galvanized escutcheon plates may be used elsewhere.

2.6 FLASHING

- A. All flashing shall be 4 lb. sheet lead and all vents penetrating the roof shall be flashed and counter flashed. Stoneman Co. roof flashing assembly with 10" skirt or equal may be used.

- B. The flashing for vents penetrating a metal roof shall have a corrosion resistant aluminum base compatible with the roofing system. A rubber type flashing by "Tech Specialties" shall be installed between the flashing and pipe.
- C. For single ply roofing, provide flashing per roofing manufacturer recommendations or installation instructions.

2.7 CLEANOUTS

- A. Provide cleanouts per Drawings and details on Drawings. Cleanouts manufactured by J.R. Smith, Mifab, Sioux Chief, or Zurn are acceptable substitutes provided they are equal if approved by the Engineer.
- B. Cleanout tops to be installed with tamper-proof screws.

2.8 FLOOR DRAINS, FLOOR SINKS AND ROOF DRAINS

- A. Provide floor drains as specified on the Plumbing Fixture Schedule. Cast iron body floor drains manufactured by J.R. Smith, Mifab, Sioux Chief, or Zurn are acceptable substitutes provided they are equal if approved by an Engineer.
- B. Provide roof drains as specified on the Plumbing Fixture Schedule. Cast iron body roof drains as manufactured by J.R. Smith, Mifab, Sioux Chief, or Zurn are acceptable substitutes provided they are equal if approved by Engineer.

2.9 WATER HAMMER ARRESTORS

- A. Provide Wilkins Piston Model #1250XL, Sioux Chief #65X-X, Precision Plumbing Products, or equal, as sized on the Drawings or required by PDI. Install per manufacturer's instructions.

2.10 AUTOMATIC TRAP PRIMERS

- A. Provide Precision Plumbing Products, J.R. Smith, Mifab, Sioux Chief, or Zurn as specified on the Drawings. Install per manufacturer's instructions.

2.11 PLUMBING FIXTURES

- A. Fixture locations, quantities, types, sizes and connections shall be as shown on both the Plumbing and Architectural Drawings. If a conflict in fixture location is noted between the Plumbing and Architectural Drawings, the Architectural Drawings shall take precedence.
- B. Fixtures shall be thoroughly protected against damage to the chrome plate or enamel, by chipping, scratching or other damage during the entire period of construction. Roof drains, floor sinks and drains, toilet and sink drains, plumbing vents, and all other similar fixtures shall be covered to prevent trash from entering the pipes until final installation of grates, domes, fixtures or other protective devices.
- C. Provide fixtures as specified in the Plumbing Fixture Schedule.
- D. Stainless Steel lavatories or sinks: Just, Elkay, Advance Tabco, Haws, or Acorn are acceptable substitutes provided they are equal if approved by Engineer.

- E. Vitreous China fixtures: American Standard, Kohler, Mansfield, Sloan, Toto, or Zurn are acceptable substitutes provided they are equal if approved by Engineer.
- F. Fixture carrier numbers listed are as specified on the Plumbing Schedule; however, carriers manufactured by J.R. Smith, Mifab, or Zurn are acceptable provided they are equal.

2.12 CONNECTORS

- A. Provide Brass Craft "Speedway" or equal heavy pattern iron pipe size brass stops, rigid or flexible supplies and chrome plated brass "P" traps. Stops in "Public" areas to have screwdriver slots and those in "Private" areas to have all cross handles.

2.13 ACCESS BOXES

- A. See section 220500 for access panels.

2.14 PRESSURE REGULATORS AND BACKFLOW PREVENTORS

- A. Provide the pressure regulator(s) and backflow preventer(s) as specified on the drawings and/or as required by the governmental authority having jurisdiction.
- B. Pressure regulators and/or backflow preventers by Febco, Hersey, or Wilkins are considered equal when their pressure fall-off/loss is equal to or less than the specified regulators/preventer's loss for the given flow rate.
- C. Provide all potable water outlets with hose attachments with non-removable hose bibb backflow preventers per the C.P.C.

2.15 WATER HEATERS

- A. Provide water heaters as specified in Plumbing Schedule or approved equal of size, capacity, recovery, and KW/BTUH input. American, A.O. Smith, Bradford White, Rheem, and State are considered equal. Heater shall be A.G.A. or U.L. listed.
 - 1. Heater storage tank shall be provided with magnesium anodes, approved standard pressure/temperature relief valve and all standard factory trim.
 - 2. Provide approved flexible copper supplies for the water heater water connections.
 - 3. Instantaneous tankless water heaters shall be with water flow activated switch to energize the electrical power source, a safety high water temperature limit, and all standard factory trim.
- B. Provide an aluminum Smitty Pan Mfg. Co. overflow pan with 1" drain outlet or equal under water heater as specified on the drawings. Oatey, HOLDRITE, & Benjamin Mfg. Co are considered equal.

2.16 PRESSURE-TEMPERATURE RELIEF VALVE

- A. Pressure-temperature relief valve shall be Wilkins TP220, TP3000 series, or equal.
- B. Piping from valve to termination shall be Type L Copper, hard drawn with wrought copper pressure fittings and 95-5 tin antimony filler metal.

2.17 EXPANSION TANK

- A. Expansion tank shall be Wilkins XT series as specified on the Drawings or approved equal in size and capacity. Amtrol expansion tanks are considered equal.

2.18 WATER HEATER SEISMIC RESTRAINTS

- A. Seismic restraints shall be Watts Spacemaker restraint system Model E-50 or E-100 as applicable for the water heater specified. Spacemaker Model #TSE-25 or Seismik Model #SR-2 may be substituted when first approved by the Engineer.

2.19 PROTECTIVE INSULATION (ADA FIXTURES)

- A. Provide approved manufactured, molded antimicrobial vinyl protective pipe and fitting covering for exposed waste and drain assembly and for hot and cold water supplies and stops. Protective system shall consist of pre-formed pipe or tubing sleeve and pre-formed fitting patterns for trap and stops. Assembly shall have integral snap fasteners.
- B. Provide protective covering for off-set drain assembly and disposer at kitchen sinks.
- C. Foam pipe wrap, duct tape, baggy-type covers, tie-strap fasteners are not acceptable.
- D. Acceptable manufacturers:
 - 1. Oatey/Dearborn Brass "ADA"
 - 2. Truebro "Lav-Guard"
 - 3. Plumberex "Pro-Xtreme"
 - 4. Zurn #Z89XX-XX

2.20 INSULATION

- A. All pipe insulation shall conform to Section 123 of the California Energy Efficiency Standards except to the extent that this Specification supersedes the minimum standards as established by the Code, in which case this Specification shall take precedent. Outside insulation shall be protected with a hard plastic or metal shell covering.
- B. Insulation and lining material shall meet requirements of flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by Procedure ASTM-E-84, NFPA 255 or U.L. 723 and shall conform to NFPA 90A and 90B.
- C. Interior primary condensate piping shall be insulated with Armacell AP/Armaflex tube insulation with reinforced lap seal or approved equal.
- D. Domestic cold water piping shall be insulated with a minimum 1" insulation in unheated areas of the building and where exposed outside of the building.
- E. Domestic hot water piping shall be insulated with Owens-Corning Fiberglass or Armacell heavy density pipe insulation 25 ASJ/SSL-II (All Service Jacket/Double/ Self-Sealing Lap). Insulation shall be UL rated non-combustible pipe insulation with a k factor of 0.24-0.28 @ 100 degrees F. mean temperature, an embossed vapor barrier laminated and pressure sealing lap adhesive. All lap and butt strips shall have integral pressure-sensitive strips and shall be applied in strict accordance with manufacturer's instructions.

1. Closed cell polyethylene foam by IMCOA or equal may be used at Contractor's option provided it meets the above requirements.
- F. Insulation thickness' shown below are based on insulation having a conductivity range of 0.22 to 0.28 per BTU/inch per hour per square foot per °F temperature of 100 degrees F.
 1. Temperature Range: Above 105°F-140°F

Pipe Size	Minimum Insulation Wall Thickness
1" and less	1.0"
1.25"	1.5"
1.5"	1.5"
2" or more	2.0"

- G. Insulation materials not meeting the specified conductivity range shall be submitted for approval and determination of the insulation thickness required.

PART 3 - EXECUTION

3.1 GENERAL CONDITIONS

- A. Examine the areas and conditions under which Work of this Section will be performed. Conditions detrimental to timely and proper completion of the Work shall be brought to the attention of the Architect before the installation of materials. Do not proceed until unsatisfactory conditions are corrected. Incorrectly installed materials requiring changes will be at Contractor's expense.
- B. All plumbing fixtures, appliances, and appurtenances furnished with manufacturer's installation instructions shall be installed per those instructions.

3.2 PLUMBING SYSTEM LAYOUT

- A. Lay out the plumbing system in careful coordination with the Drawings. Determine proper elevations for all components of the system and use only the minimum number of bends to produce a satisfactorily functioning system.
- B. Follow the general layout shown on the Drawings in all cases except where other Work may interfere.
- C. Lay out pipes to fall within partitions, walls, or roof cavities, and to not require furring other than as shown on the Drawings.

3.3 PIPING INSTALLATION

- A. Pipe sizes as shown on drawings are Nominal Pipe Size (NPS) or Iron Pipe Size (IPS). Drawings and fixture schedule indicate pipe sizing per the CPC and Standard Engineering Practice. Pipe sizes shall be maintained to fixtures, appliances and equipment. Approved reducing fittings shall be installed at all points of connections.
- B. Install piping generally square with building, free of traps or air pockets, and true to line and grade. Keep all piping tight to the building structure, unless pipe slope is required. Do not install piping in any locations where, in the Architect's opinion, it will interfere with the use of the building or create a safety hazard. Where space is inadequate, notify the

Architect in time to avoid unnecessary Work. Install all exposed piping as high as possible without interfering with other trades.

- C. Make changes in direction with manufactured fittings; use long radius elbows. Street elbows, bushings, close nipples and bending of pipe or tubing will not be allowed.
- D. Provide "P" traps at sanitary sewer drainage devices without integral traps.
- E. Underground plastic pipe will horizontally transition to metal pipe 5 feet before the above ground riser. Install plastic pipe with a minimum of 36" of cover when located under areas of possible vehicle traffic. Approved metallic pipe must be used if the minimum depth is not met. A tracer wire, terminating at each end at an exposed location, will be installed with all underground plastic pipe
 - 1. Piping may terminate a maximum of one foot above ground when encased in a listed metallic transition riser.
- F. Use friction wrenches when installing brass, polished, or soft metal piping, and when installing piping exposed in finished areas. Replace piping showing wrench marks.
- G. Attach escutcheon plates to pipes with set screws or spring clamps with concealed hinges. Continue insulation through escutcheon plates.
- H. General:
 - 1. Proceed as rapidly as the building construction will permit.
 - 2. Thoroughly clean items before installation. Cap pipe openings to exclude dirt until fixtures are installed and final connections have been made.
 - 3. Cut pipe accurately, and work into place without springing or forcing, properly clearing windows, doors, and other openings. Excessive cutting or other weakening of the building will not be permitted.
 - 4. Show no tool marks or threads on exposed plated, polished, or enameled connections from fixtures. Tape all finished surfaces to prevent damage during construction.
 - 5. Provide sufficient swing joints, ball joints, expansion loops, and devices necessary for a flexible piping system, whether or not shown on the Drawings.
 - 6. Support piping independently at pumps, coils, tanks, and similar locations, so that weight of pipe will not be supported by the equipment. Support the equipment independently from the pipe.
 - 7. Pipe the drains from mechanical equipment, drip pans, relief valves, air vents and similar locations, to an open sight drain, floor drain, or other acceptable discharge point, and terminate with an air break or air gap per C.P.C.
 - 8. Securely bolt all equipment, isolators, hangers, and similar items in place.

3.4 IDENTIFICATION OF PIPING SYSTEMS

- A. Use pipe material compatible pipe labels and markers.

3.5 HANGER AND PIPE SUPPORT INSTALLATION

- A. Support pipes from structure with specified assemblies. Provide auxiliary members, anchors, guides, and sway braces necessary to maintain pipe alignment and prevent excessive movement or strain on piping system or components; allow for expansion and contraction of piping. Provide at least one hanger for each branch. Do not use powder driven fasteners, wire, perforated tape, nails, wood blocking, or other makeshift devices to support pipe.
- B. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- C. Isolate piping systems from building structure to minimize noise transfer by using acoustic suspension isolator silencer and bracket system.
- D. Protect tubing and piping from damage caused by abrasion when passing through studs, joists, and similar framing using abrasion protection isolators.
- E. Penetration Protection: Provide allowance for thermal expansion and contraction of copper tubing passing through a wall, floor, ceiling or partition by wrapping with an approved tape or pipe insulation, or by installing through an appropriately sized sleeve. Penetrations of fire resistance rated assemblies shall maintain the rating of the assembly.
- F. In plenum-rated applications, use tested clamp and isolator support systems designed specifically for this application.
- G. Prevent damage to piping and tubing caused by contact between dissimilar metals using insert system designed specifically for this application.
- H. Attach supports to structure with bolts, screws or concrete anchors, per support manufacturer's requirements.
- I. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.6 JOINTS AND CONNECTIONS

- A. Cut pipe shall be reamed to full inside diameter of pipe. Cut threads straight and true. Ensure all filings have been removed from inside of the pipe. Apply liquid Teflon to male pipe threads and not inside fittings. Use graphite on cleanout plug threads.
- B. Couplings in cast iron "No-Hub" soil/waste pipe and fittings shall be made up with neoprene gaskets and stainless steel bands conforming to CISPI 310, torque to the manufacturer's specification with an approved torque wrench. Joints in hub and spigot shall be made up with compression gaskets conforming to ASTM C-564.
- C. Joints in copper tube shall be made with 95-5 tin antimony or lead-free solder, applied in strict accordance with the manufacturer's directions.
- D. Dissimilar metals shall be isolated with dielectric couplings, "EPCO" or approved equal. Dielectric Waterway Fittings shall be UL classified in accordance with ANSI / NSF-61 for potable water service, Victaulic Style 647. Provide access panels at all hidden couplings.

- E. All plastic pipe shall be joined in accordance with the manufacturer's recommendations for their pipe and IAPMO Installation Standard per the latest edition of the C.P.C.
- F. Press Connections: Copper press fittings shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.
- G. Pipe Protection: Provide protection against abrasion where copper tubing is in contact with other building members by wrapping with an approved tape, pipe insulation or otherwise suitable method of isolation.
- H. Penetration Protection: Provide allowance for thermal expansion and contraction of copper tubing passing through a wall, floor, ceiling or partition by wrapping with an approved tape or pipe insulation, or by installing through an appropriately sized sleeve. Penetrations of fire resistance rated assemblies shall maintain the rating of the assembly.

3.7 SANITARY SEWER, VENT AND INDIRECT WASTE SYSTEM INSTALLATION

- A. Install horizontal drainage piping at a minimum 2%, condensate 1%, slope unless otherwise noted. Where this is impractical notify the Architect before installing the pipes.
- B. Install vent piping to drain back into the sewer system.
- C. Provide cleanouts where shown on Drawings and where required by governmental agencies having jurisdiction.
 - 1. All cleanouts to grade shall be firmly secured by means of a concrete block 20" square by 5" thick, and shall be flush with finished grade, unless otherwise noted on the plans.
- D. Provide automatic trap primers as specified at floor sinks and drains as indicated on Drawings or where required by governmental agencies having jurisdiction. Provide access panels for all hidden mechanical trap primers.

3.8 VALVE INSTALLATION

- A. Provide valves in the water systems. Locate and arrange to provide complete regulation of apparatus, equipment, and fixtures.
- B. Provide valves in at least the following locations:
 - 1. In branches and/or headers of water piping serving a group of fixtures.
 - 2. On both sides of apparatus and equipment.
 - 3. For shutoff of risers and branch mains.
 - 4. For flushing and sterilizing the system.
 - 5. Where shown on the Drawings.
- C. Locate valves for easy accessibility and maintenance. Provide access panels for all hidden valves.

- D. Unions shall be installed downstream of all screwed valves.

3.9 WATER HAMMER ARRESTOR INSTALLATION

- A. Provide water hammer arrestor on hot and cold water lines.
 - 1. Install at all quick closing valves, solenoids, and supply headers at plumbing fixture groups.
 - 2. Locate and size as shown on Drawings, and where not shown, locate in accordance with Plumbing and Drainage Institute Standard WH-201.
 - 3. Install water hammer arrestor behind access panels.

3.10 BACKFLOW PREVENTION INSTALLATION

- A. Protect plumbing fixtures, faucets, hose connections, and other equipment having plumbing connection, against possible back-siphonage.
- B. Arrange for testing of backflow devices as required by the governmental agencies having jurisdiction.

3.11 PLUMBING FIXTURE INSTALLATION

- A. Connect plumbing services to fixtures as shown on Drawings and as specified.
- B. Install compression stops and flexible supplies per fixture manufacturer's recommendation or as high as possible on wall directly below fixtures.
- C. Install fixtures at right angles to, and tightly against, building surfaces, and in proper alignment. Fill gaps between fixtures and building surfaces with white grout. Mounting heights and locations shall be as shown on the Drawings, or, if not shown, as directed by the Architect.

3.12 INSULATION INSTALLATION

- A. Clean and dry surfaces prior to application of insulation or adhesives.
- B. Insulate piping, fittings, valves, and strainers. Leave unions exposed. Where insulation terminates, bevel ends of insulation and continue jacket over insulation and secure to pipe. Do not interrupt insulation at hangers, supports, clamps, or penetrations through structure. Fittings shall be finished with "Zeston" or approved equal fitting closures. If fitting closures not available, use 8 oz. canvas dipped in "Seal-Fas".
- C. Attach longitudinal jacket laps and butt strips with factory applied pressure sensitive adhesive. On concealed piping only, outward clinching coated staples at two inch spacing may be used. Cover elbows with one piece polyvinyl chloride covers. Secure with tack fasteners. Tape ends of covers with matching tape on exposed piping. Seal off all cut ends with canvas and Benjamin Foster 30-36.
- D. Install closed cell polyethylene foam per manufacturer's instructions.
- E. Insulate traps and trap arms on floor sinks located above slab receiving discharge from ice machines and soda dispensers with ½" insulation.

- F. Insulate primary condensate piping located within return air plenums with $\frac{1}{2}$ " wall thickness.

3.13 TESTING AND ADJUSTING

- A. Provide personnel and equipment, and arrange for and pay the costs of, all required tests and inspections required by governmental agencies having jurisdiction. See Section 220500 for testing requirements.
- B. Where tests show materials or workmanship to be deficient, replace or repair as necessary, and repeat the tests until the specified standards are achieved.
- C. Adjust the system to optimum standards of operation.

3.14 CLEANING (For potable water systems.)

- A. Disinfection: The copper hot and cold water distribution system shall be disinfected prior to being placed in service. The system shall be disinfected in accordance with AWWA C651 or the following requirements:
 - 1. The piping system shall be flushed with potable water until discolored water does not appear at any of the outlets.
 - 2. The system shall be filled with a water chlorine solution containing at least 50 parts per million of chlorine. The system shall be valved off and allowed to stand for 24 hours. Or, the system shall be filled with a water chlorine solution containing at least 200 parts per million of chlorine. The system shall be valved off and allowed to stand for 3 hours.
 - 3. Following the standing time, the system shall be flushed with water until the chlorine is purged from the system.
 - 4. Provide bacteriological sampling and analysis results to the Engineer for review.

3.15 WARRANTY

- A. The contractor shall warranty all systems for proper operation installed by the contractor for not less than one calendar year from date of project completion. This completion date shall be set by the Architect or owner.

END OF SECTION 220000

**SECTION 220500
COMMON WORK RESULTS FOR PLUMBING**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Related Documents:
 - 1. The other Contract Documents complement the requirements of this Section.
 - 2. Division 01 - General Requirements applies to the Work of this Section.
 - 3. Where requirements of this Section exceed those in other Contract Documents, Contractor shall comply with the requirements of this Section.
- B. Codes and Regulations:
 - 1. In addition to complying with the specified requirements, comply with pertinent regulations of governmental agencies having jurisdiction.
- C. Included: Work includes, but is not limited to the following:
 - 1. Plumbing
 - 2. Fire Protection
 - 3. Carpentry and metal Work required for Work of this Section and not specifically shown under another Section. Openings in concrete or masonry construction shall be either core drilled or saw cut unless indicated otherwise on Drawings.
 - 4. Excavation and Backfill
 - 5. Coordination Drawings
 - 6. Demolition:
 - a. The Demolition Plans were prepared for the convenience of the Contractor. The Engineer does not represent that all items, which may require demolition, have been shown. It shall be the responsibility of the Contractor to carefully examine the site and the Contract Documents and to perform all demolition and reconstruction, which may be required for the proper execution, and completion of work.
- D. Related Work:
 - 1. Painting (Division 09)
 - 2. Cutting and Patching
 - 3. Low voltage electrical control

1.2 DEFINITIONS

- A. Furnish: Purchase and deliver to job site in new condition.

- B. Install: Receive and store at job site until required; place secure and connect; furnish required appurtenances.
- C. Provide: Furnish and install as defined above.
- D. Section: Refers to a Section of these Specifications.
- E. Standards: The issue in effect as of the date of the contract documents.

1.3 PROJECT RECORD DRAWINGS

- A. Comply with pertinent provisions of Architectural Specification Sections.

1.4 SERVICE INTERRUPTIONS

- A. When Work of this Section requires temporary shutdown of existing systems for connections, the shutdown shall be made only during pre-arranged time agreeable to the Owner.

1.5 CORRELATION, INTERPRETATION AND INTENT OF CONTRACT DOCUMENTS

- A. The Mechanical/Plumbing Drawings are, in general, made to scale and the Contractor may obtain approximate distances and dimensions by scaling the Plans. It is distinctly understood, however, that it is done entirely at the Contractor's responsibility. Refer to Architect's Plans and Specifications for construction details, which will affect the Work and equipment. Examine the Architectural, Civil, Structural, Mechanical, Electrical, Landscape, Irrigation, Data, Fire Protection and Plumbing Plans and Specifications to ensure that this work does not conflict with the above trades. Plumbing, Mechanical and Electrical Plans are diagrammatic and, therefore, do not necessarily represent the exact installation. However, pipe sizing for utility services and ductwork are calculated per their respective codes and Standard Engineering Practice and shall be installed as sized from point of origin to terminal point. It shall remain the Contractor's responsibility to submit Shop Drawings if he/she has any questions about the final arrangement. Nothing on these Plans or Specifications shall be construed to permit work not conforming to all applicable codes and regulations.

PART 2 - PRODUCTS

2.1 ACCESS PANELS

- A. If not called for under other Sections, furnish Milcor, Elmdor, or Jay R. Smith access panels where shown on the Drawings or required for maintenance access to completed Work of this Section. Submit size, type, and location of proposed access panels not specifically shown, for review by Architect.
- B. Access panels shall be constructed of 16 gauge prime coated steel or stainless steel with screwdriver operated cam latch, concealed hinges, and fire rating equal to adjacent construction.
- C. Provide flush type doors with:
 - 1. Stainless steel finish for tiled surfaces.
 - 2. Prime coated finish for other surfaces.

2.2 FLASHING

- A. Provide watertight flashing at all openings through exterior walls and roof. Refer to Architectural Drawings.

2.3 VIBRATION ISOLATION AND NOISE CONTROL

- A. All equipment shall be securely mounted to and/or supported from the structure.
- B. Isolate all bare water piping from structural members or hangers with "Trisolators" or submitted and approved equal insulating sleeves. Install hangers on outside of insulated jacket on all insulated lines.

2.4 WEATHERPROOFING

- A. All equipment exposed to the weather shall be protected by means of a suitable finish (i.e. paint). Water rated, exterior hoods shall be provided over motors, belts, and other devices to ensure against damage by water. At all locations where pipes penetrate exterior walls, or roofs, suitable rain tight flashing shall be provided.

2.5 PIPE WRAPPING

- A. All pipe, metal components, and joints buried in ground shall be primed and protected with 10-mil tape double wrapped or approved equal per IAPMO IS 13-2006. Before tape application, all bare pipe and fittings to be wrapped must be coated with pipe wrap primer. Stretch first layer of tape to conform to the surface while spirally half-lapping, apply a second layer, half-lapped and spiraled as the first layer with spirals perpendicular to first wrapping. In lieu of tape wrap, heat shrinkable 10-mil minimum thick polyethylene sleeve may be used.
- B. When applying tape, use only enough pull to cause the tape to properly conform to the irregular surfaces of the item. The proper amount of pull is reached when the tape surface is smooth without any wrinkles. Continue tape 4" above grade. End overlaps should point down. Tape shall be applied per manufacturer's installation instructions.

2.6 ELECTRIC MOTORS AND ELECTRICAL DEVICES

- A. All Electric motor current characteristics are as shown in equipment schedules on drawings and as specified hereinafter in this Specification. The Contractor shall refer to the Electrical Plans and shall confirm all motor voltage, amperage and phase characteristics before processing submittals or ordering equipment. If any equipment is installed different from the supplied electrical power, it is the contractor's responsibility to correct equipment to the required electrical characteristics.
- B. All electrical devices of a type normally listed by Underwriters Laboratories, Inc. shall bear U.L. label of approval.

2.7 PAINTING AND FINISHING

- A. Provide the coating specified below unless otherwise specifically called for under Painting, Division 09. Exclude non-ferrous items, stainless steel, items to be insulated, and factory-finished items. Conform to requirements of the Painting Section where requirements are not specified in this Section.

- B. All materials used, except as otherwise specified in carrying out the provisions of the contract, are to be Fuller-O'Brien manufacturer or approved equal. Numbers given below are Fuller-O'Brien Company designation unless noted otherwise.

1. Primer coat for all exterior and interior materials: 1 Coat - Primer #66850
2. Finish coats as listed below:

Exterior concrete and concrete block	2 Coats – Semi-Gloss #664XX
Interior concrete and concrete block	2 Coats – Semi-Gloss #214XX
Exterior metal	2 Coats – Semi-Gloss #664XX
Interior metal	2 Coats – Semi-Gloss #214XX
Exterior galvanized metal	2 Coats – Semi-Gloss #664XX
Exterior stucco	2 Coats – Flat #668XX
Interior of Grilles, Diffusers, and Registers	1 Coat – Flat (black) #31202

3. Furnish equipment with factory or field-applied prime coat and finish coat of enamel. Restore damaged finishes to match original.

PART 3 - EXECUTION

3.1 GENERAL EQUIPMENT INSTALLATION REQUIREMENTS

- A. Install equipment to provide neat appearance, required manufacturer's access, and required space to allow replacement or maintenance. Provide bases, supports, anchor bolts, and other items required to install equipment. Installation shall be level and braced per CBC.
- B. Equipment shall operate quietly and without objectionable vibration. Excessive vibration, other than from specified equipment operating at optimum conditions, shall be the Contractor's responsibility and shall be eliminated as directed by Architect.

3.2 COORDINATION OF WORK

- A. Coordinate Work of this Section with Work of other Sections to avoid conflicts. If required, provide shop drawings and submit to Architect for approval.
- B. Insure that Work of other Sections is suitable to accommodate Work of this Section.

3.3 ADEQUACY OF FURRING

- A. Conceal piping in spaces provided unless specifically shown otherwise. If spaces are inadequate, notify Architect prior to ordering materials and fabrication of components.

3.4 PROTECTION AND CLEANING

- A. Protect equipment from dirt, moisture, and mechanical damage during construction. Restore or replace damaged equipment to original condition.

- B. Keep interior of piping and ductwork free of foreign material during construction. Flush piping systems with test medium specified under Piping Tests before installing equipment and appurtenances or making final connections.

3.5 CLOSING-IN OF UNINSPECTED WORK

- A. Do not conceal or cover Work before tests and observations are completed. Uncover Work prematurely closed in and repair resulting damage to all Work, if requested by Architect, Engineer, or Project Inspector.

3.6 DAMAGE

- A. Repair or replace items damaged by leaks or overflow from Work provided under this Section and for any damage to any part of the project site, for a period of 1 year after notice of completion date. This is in addition to and not a limitation of other rights the Owner may have against the contractor under the Contract Documents.

3.7 PAINTING AND FINISHING

- A. The contractor shall examine carefully all surfaces to be finished under the contract; and before beginning any of his work shall see that the work of other trades has been left or installed in a workmanlike condition to receive paint, or a particular finish.
- B. The contractor shall take the necessary steps to protect his work and the work of other contractors during the time his work is in process and the contractor shall be responsible for any and all damage to the work or property of other contractors caused by his employees or by himself.
- C. Provide protective covers or drop cloths to protect floors, fixtures, and equipment. Exercise care to prevent paint being spattered on to surfaces which is not to be painted. Surfaces, from which such paint cannot be satisfactorily removed, shall be painted or repainted, as required to produce a finish satisfactory to the Architect.
- D. Cracks, holes, or imperfections in concrete or plaster are to be filled with patching plaster and smoothed off to match adjoining surfaces.
- E. All surfaces shall be in a proper condition to receive finish. Clean surfaces as necessary to receive paint. Remove all grease from metal surfaces before painting.
- F. Each coat of paint shall be applied at proper consistency and brushed evenly, free of brush marks, sags, runs, and with no evidence of poor workmanship. Color between coats of paint shall differ; (Color variations between coats should be enough to impair hiding.) Care shall be exercised to avoid lapping of paint on glass or hardware. Paint to be sharply cut to lines. Finished paint surfaces to be free from defects or blemishes.
- G. Exposed piping shall be painted. Exposed piping, except for identification banding, shall be painted to match surfaces adjacent. Each coat to be inspected when dry and subsequent coat not to be applied until approval received.
- H. The contractor shall store all painting materials and equipment outside of the building. The receiving and moving of all paint materials and mixing shall be done outside of the building. Any other arrangements shall be made only with Architects approval.

- I. All necessary precautions shall be taken to prevent fire. Rags, waste, etc., soiled with paint or cleaning material, shall be removed from the premises at the end of each day's work.

3.8 MECHANICAL SYSTEM TESTING

- A. Furnish all test pumps, gauges, and equipment. Test all safety controls and devices.
- B. For air tests, install a calibrated test pressure gauge in the piping system to observe any loss in pressure. Calibrate the test pressure gauge with a dead weight tester within 15 days before use and certify by initial and date on a sticker applied to the dial face. Maintain the required test pressure for the time indicated. Brush joints with a soapy water solution to check for leaks if the required pressure cannot be maintained.
- C. After any test, repair all leaks found as directed and re-test as necessary until the system is proven tight.
- D. Before applying test pressure to any piping systems the Contractor shall be responsible for isolating all equipment e.g. control valves, regulators, relief devices, tanks and any other line accessories, which would otherwise be damaged by the test pressure.
 1. Soil, Waste, Vent, Roof, and Condensate Drainage:
 - a. Entire System: Tightly close all openings except the highest one. Fill to overflowing with water.
 - b. Sections of System: Tightly close all openings except the highest opening of the section under test. Fill section with water to test each section with a minimum 10-foot head of water except for the uppermost 10 feet of the system.
 - c. Allow to stand for (4) hours or longer, as required to complete the inspection.
 2. Domestic Water: Fill with water and test at 150 psig. Retain for (4) hours.
- E. After all Systems have been tested as outlined, all flow rates shall be balanced, and all control devices adjusted. See Section 220000.
- F. The equipment and installations shall be operated by the Contractor and he shall demonstrate that all Systems are performing according to the requirements of the Plans and Specifications and to the satisfaction of the Architect, Engineer and Owner.
- G. Acceptance Testing Requirements: For applicable mechanical acceptance tests see the T-24 plan sheets. All forms, regulation and requirements are available online at www.energy.ca.gov/title24.

3.9 CUTTING AND PATCHING

- A. The Contractor shall do all cutting and patching which may be required for the installation of the Work under this Division of the Specifications. Patching shall be of the same quality, materials and finish as, and shall match accurately, all surrounding construction. No cutting of the Structure shall be permitted without the approval of the Architect.
- B. Wherever concrete or paved surfaces are cut to provide for the installation under this Section, the Contractor shall restore the surfaces to their original condition. Subgrade

materials, concrete, and paving materials, along with the placement of same, shall be in accordance with the respective Sections of this Specification as they apply to the installation of such material.

3.10 EXCAVATION AND BACKFILL: (Buried pipes within the building walls and to 5 feet from the building.)

- A. Dig trenches straight and true to line and grade; bottom shall be left smoothed of rock points. Pipe shall be supported for the entire length on undisturbed, original earth. The minimum trench width shall be 16" and all pipe shall be 2 feet below the finished grade, minimum, wherever conditions permit. Sewer pipes to be below grade as necessary to meet the slope and invert on the Drawing. Whenever substantial variations of pipe bury is indicated by field conditions, the proposed changes in depth of bury shall be submitted, in writing, to the Architect for approval.
- B. Installation of Thermoplastic Pipe and Fittings: Trench width for thermoplastic sewer pipe shall be 1.25 times the outside diameter of the piping plus 12 inches or the outside diameter of the piping plus 16 inches. Thermoplastic piping shall be bedded in not less than 4 inches of granular fill supporting the piping. The backfill for thermoplastic piping shall be compacted along the sides of the piping in 6 inch layers and continue to not less than 12 inches above the piping. Compaction shall be not less than a 85 percent standard proctor density.
- C. All piping shall be laid on a bed of clean dry sand not less than 6" thick. The space between the pipe and the sides of the trench shall be backfilled with clean dry sand to a point 6" above the crown of the pipe. Both sides of the pipe shall be filled at the same time.
- D. The remainder of the trench shall be backfilled with native soil in lifts no greater than 12" and shall be mechanically compacted by tamping so to maintain a minimum relative dry density of 95%, determined by California Impact Test Method No. 216.
- E. All backfilling shall be brought flush with finished subgrade.
- F. Excess material shall be removed from the site. Trenches shall be backfilled immediately after approval.

3.11 INSTALLATION OF PIPING AND EQUIPMENT

- A. The installation of piping and equipment shall be made in such a manner to clear beams and obstructions. Do not cut into or reduce the size of plates or any load carrying members without approval of the Architect. Check Drawings and Work of others to prevent interference. Deviations of the Work determined by the Architect shall be installed by the Contractor without additional cost.
- B. Install piping promptly, cap or plug open ends of pipe. No piping shall be permanently covered by construction before inspection and approval. Piping shall be installed in accordance with best practice and recommendations of the manufacturer.
- C. Conceal piping unless indicated otherwise. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions. Remove defective material from site. Install piping generally level, free of traps and unnecessary bends to conform with building requirements and provide space for other work. Piping to be free of unusual noises. Avoid any possible galvanic action by isolating dissimilar metals with suitable Dielectric Insulating Fittings.

- D. Unless called for otherwise, hereinafter in this Specification or by specific detail on the Drawings, all water pipes in contact with structure and/or hangers shall be suitably isolated. In the case of uninsulated pipe, "Trisolators" or equal shall be used.
- E. Protect enameled or polished equipment from damage, tool marks, etc.

3.12 STERILIZATION OF PIPES

- A. After preliminary purging of the Systems, the entire domestic potable water system pertaining to Work under this Contract shall be chlorinated in accordance with American Water Works Association, State of California Health and Safety Code procedure for disinfecting water mains. A thorough flushing operation shall be run upon completion of sterilization. The contractor shall then arrange with local health authority for test on mains and water systems and provide three (3) copies of test results to the Architect.

3.13 EQUIPMENT IDENTIFICATION TAGS

- A. Major pieces of equipment shall include, but are not limited to: water heaters shall be tagged.
 - 1. Tags shall be 2" x 2" x 1/8" thick Formica/plastic engraving stock beveled on both sides and with two 3/16" diameter holes near the top uppermost tag corners.
 - 2. Tags shall be white with 3/8" high red engraved letters.
 - 3. Tags shall be attached to the equipment with bolts, screws or chains as per valves.
 - 4. Tags shall have the following information:
 - a. Equipment number and nomenclature corresponding to the information on the mechanical contract drawings, and where multiple systems are installed in a building, equipment tagging shall include the space or area served.
 - b. Examples:

WATER HEATER	CIRCULATION PUMP	
WH-1	CP-1	
FIRST FLOOR		

3.14 IDENTIFICATION OF PIPING SYSTEMS

- A. Building Systems:
 - 1. Piping systems installed anywhere within the scope of the Work shall be identified as to contents using a color banding and marking system as outlined and in compliance with Federal OSHA requirements.
 - 2. This Work includes furnishing and application of all snap-around and/or self-sticking pipe markers. Formica valve tags, chains, wires, and related materials proper for the completion of the Work.
 - 3. Pipe markers shall be permanently shaped vinylite plastic snap-around pipe markers as manufactured by Seton Nameplate Corporation, Wilmington Plastic Company, or approved equal.

4. Background colors shall be used and shall conform to the ANSI/ASME A13.1 color scheme, lettering size, length of color field, and viewing angles of identification devices. The names of materials (pipe contents) shall be superimposed on these ANSI background colors. Work legends shall conform to ANSI A13.1 to avoid confusion and mistakes. Basic background colors and content classification are:

Red	Fire Quenching Fluids
Orange	Toxic or Corrosive Fluids
Yellow	Flammable Liquids
Brown	Combustible Fluids
Green	Potable, Cooling, Boiler Feed, Other Water
White	Abandoned Pipes
Blue	Compressed Air
Purple	Defined by User, Non-Potable Water

5. Pipe marking and installation shall be as follows:
- Apply "Plastic Pipe Marker" at each valve to show proper identification of pipe contents.
 - Use an "Arrow Marker" with each "Pipe Content Marker". The Arrow shall always point away from the "Pipe Marker" and in the direction of the flow.
 - If flow can be in both directions, use a double-header "Arrow Marker".
 - Apply "Pipe Marker" and "Arrow Marker" at every point of pipe entry and exit where the line goes through the wall, floor or roof.
 - Apply "Pipe Marker" and "Arrow Marker" on each riser and "T" joint.
 - Apply "Pipe Marker" and "Arrow Marker" every 50 feet on long continuous lines.
 - Identifying long continuous lines with "Pipe Marker and "Arrow Marker at every bay or aisle within the building. All branch runs from mains on the roof shall be identified with "Pipe Marker" and "Arrow Marker" at the point of takeoff.
 - Apply "Markers" on the two lower quarters of the pipe where view is unobstructed. In this position "Markers" are read at a glance from ground floor level and dust will not obscure the "Marker". Roof-mounted piping "Markers" shall be so located that they can be read from a standing position on the roof.
 - All identification markers located out of doors and exposed to the sun and the elements shall receive one coat of clear lacquer after application to the pipe, to seal edges and to act as a protective coating.

- j. Each "Arrow Marker" must have the same ANSI background color as its companion "Pipe Marker". Arrow must point away from "Pipe Marker" and indicate direction of flow.
 - k. "Pipe Markers" shall be guaranteed to stay on pipe systems for a period of not less than five years.
6. Following is a list of, but not necessarily limited to, the more commonly used piping systems that require identification "Pipe Markers" and "Arrow Markers".

Abbreviations on Drawings	Wording to Put on Pipe Marker	ANSI Color Background
HWS	Hot Water Supply	Green
CW	Domestic Cold Water	Green
S	Gravity Sewer or Drain	Green
V	Vent	Green
FM	Fire Protection Water	Red
CD	Condensate Drain Return	Green
All text lettering shall be black on the white, yellow, and orange backgrounds. White text lettering shall be on all other background colors.		

3.15 SEISMIC BRACING

- A. It shall be required that pipes be supported and braced per the most current edition of SMACNA "Seismic Restraints Manual Guidelines for Mechanical Systems".
- B. When the SMACNA "Seismic Restraint Manual Guidelines for Mechanical Systems" does not specifically address the size of duct or pipe to be braced, the following shall apply:
 - 1. All pipes shall be braced and guyed to prevent lateral or horizontal swing to the satisfaction of the Architect, Engineer, and State Inspector. Absolutely, no "Plumber's Tape" shall be used anywhere on this project.
- C. The SMACNA Manual can be obtained through SMACNA online. Contractor shall obtain manual prior to the start of any work.

3.16 OPERATION AND INSTRUCTION

- A. The Contractor shall furnish competent Technicians to supervise start-up operations of equipment specified by the Architect or Engineer and to instruct Owner's operators. The Contractor shall furnish six complete sets of operating instructions and service manuals to the Architect.
- B. Instruction period shall be started after instruction books and service manuals have been submitted to and approved by the Architect and shall be at hours (regular and non-regular) arranged by the Architect.
- C. Service manuals shall include oiling, cleaning, and servicing data, compiled in clearly and easily understood form and in a durable binder. Data shall show all serial numbers of every piece of equipment and complete list of replacement parts.

3.17 WARRANTY

- A. The contractor shall warranty all the systems for proper operation installed by the contractor for not less than one calendar year from date of project completion. This completion date shall be set by the Architect or Owner.

END OF SECTION 220500

SECTION 230000 - HEATING, VENTILATION, AND AIR CONDITIONING**PART 1 - GENERAL****1.1 DESCRIPTION:****A. Related Documents:**

1. The other Contract Documents complement the requirements of this Section and apply to this Section.
2. Division 1 - General Requirements and Section 230013 apply to the Work of this Section.
3. Where requirements of the Section exceed those in other Contract Documents, Contractor shall comply with the requirements of this Section.

B. Codes and Regulations:

1. In addition to complying with the specified requirements, comply with pertinent regulations of governmental agencies having jurisdiction.
2. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirements will govern when so directed by the Architect.

C. Included: Work includes, but is not necessarily limited to, the following.

1. The Work covered by this Specification shall include furnishing labor, material, equipment and services to construct, install and place in operation, the complete Heating, Ventilating and Air Conditioning Systems to the extent as indicated, and as shown on the Drawings and specified herein. The Work covered under this Section shall hereinafter be referred to as the Mechanical System.
2. A system of temperature controls shall be furnished and installed complete as hereinafter described. Low voltage wiring and conduit, complete with electrical accessories and materials as required for the installation of the temperature control system shall be furnished and installed under this Section of the Contract but shall conform to the Specification requirements as set forth under Division 26.
3. Fan Coil Units
4. Heat Pump Condensing Units
5. Economizer Mixing Boxes
6. Centrifugal Exhaust Fans and Roof Exhausters
7. Hooded Roof Openings for Building Gravity Relief & Outside Air Intake
8. Supply, return, and exhaust duct systems complete with grilles, registers and diffusers.
9. Filter and Filter Boxes
10. Duct, Pipe and Equipment Insulation
11. Space Temperature Controls
12. Refrigerant Piping
13. Fire Dampers

14. Vibration Isolators

D. Work Not Included In This Section:

1. Blocking, framing, and wood supports required for the purpose of accommodating the Mechanical System unless specifically called for under this Division. The contractor is responsible for the correct location of such items and shall bear the expenses covering their omission or improper location.
2. Electrical connections to motors, electric starters, disconnect and over-current protective devices, unless specifically called for by this Section, or unless the equipment is furnished as an integral part of the Mechanical System Equipment, as hereinafter specified or noted on the Drawings.
3. Line voltage electrical wiring and conduit, except where specifically called for on the Drawings or hereinafter in this Section.
4. Painting, except when supplied as factory finish, or specifically called for in this Section or on Drawings.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.
- B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the Work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

1.3 SUBMITTALS

- A. If the heating and/or air conditioning units are substituted with a different brand than that specified on the Drawings, the Title 24 Energy Compliance Calculation may have to be re-run. This re-calculation is NOT to be considered a general CA Task and will be billed hourly (6 hr minimum) as an Additional Service at the current rate defined in Exhibit B for Senior Energy Analyst.
- B. Comply with pertinent provisions of Architectural Section.
- C. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit 6 copies of the following to the Architect for approval prior to acquisition:
 1. Materials list of items proposed to be provided under this Section including, but not limited to heating, ventilating and air conditioning equipment and mountings, air distribution equipment, ductwork and fittings, flexible ductwork, flue vent pipe, duct specialties, flexible connections, insulation, lining and adhesive, duct joint sealer, temperature controls, piping and accessories.

2. Manufacturer's specifications, catalog cuts, and other data needed to prove compliance with the specified requirements. All pieces of equipment shall be clearly identified on corresponding manufacturer's literature being submitted.
3. Shop Drawings or other data as required to indicate method of installing and attaching equipment, except where such details are fully shown on the Drawings.
4. Submittals for entire Project shall be submitted at the same time or may be rejected until all are included in one submittal package.
5. Submittals shall be provided electronically in PDF format, bookmarked by design tags for equipment and specification sections for materials. Alternatively, hard copies will be accepted if 6 copies are provided, bookmarked as previously noted and bound together separately in three-hole folders or three ring binders.

1.4 DESIGN CHANGES CAUSED BY PRODUCT SUBSTITUTIONS

- A. Contractor shall pay costs of design and installation for changes resulting from substitution of alternate products.
- B. Acceptance of alternate products by Architect does not change this requirement.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of Architectural Sections.

PART 2 - PRODUCTS

2.1 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

- A. Heating, Ventilating, and Air Conditioning Equipment: Equipment shall be as specified on the Drawings. All other equipment shall be pre-approved by the Mechanical Engineer.
- B. It shall be the responsibility of the Contractor to see that any substituted equipment performs similarly to that which is specified and fits in the same area as specified. Cost of any additional Work caused by the substitution of equipment shall be borne by the Contractor.

2.2 AIR DISTRIBUTION EQUIPMENT

- A. Grilles, registers and ceiling diffusers and other accessory equipment shown on the Drawings and "Grille, Register and Diffuser Schedule" shall be manufactured by Titus unless shown otherwise.
- B. Any substitutions of the above equipment which may be proposed by the Contractor shall be re-sized to suit his equipment by the proposed manufacturer and submitted in tabular form listing components proposed for each location in the System, identifying each as to location, design, air quantity passing through the devices, pressure drop, noise criteria data, velocities of air leaving the device and "K" flow factors for each item. Manufacturer's data sheets showing dimensions and recommended method of installation for each component must also be included.

2.3 CONTROL DAMPERS

- A. General Use: Provide Greenheck model VCD-23, class 1 @ 4"wg as scheduled on plans. Damper frame shall be galvanized steel, formed into a 5" X 1" structural hat channel. Blades shall be 16 gauge galvanized steel strengthened by three longitudinal 1" deep Vee grooves running the entire length of each blade. Blade seals shall be TPE. Jamb to be flexible stainless steel compression type. The Linkage shall be concealed in the frame out of the air stream, plated steel material. The Axle

shall be plated steel material. Axle Bearings to be synthetic. Finish shall be Hi-Pro polyester power coat.

2.4 LOUVERS

- A. 4" deep louvers, Greenheck, Model ESJ-401, or approved equal. Deflection blades shall be spaced on 4" centers having 1/2" high vertical baffle and an additional lateral center rain hood. The edges of louver blades shall be folded or beaded to exclude driving rain. Louvers blades shall be oriented to minimize the entrainment of rainwater. Louver blades, heads, sills, jambs, braces and mullions shall be made of aluminum. Louvers shall be provided with flanges.
- B. Provide 1/2" aluminum bird screen on outside air intake louvers.

2.5 RECTANGULAR SHEET METAL DUCTWORK

- A. Rectangular supply, return, outside air and exhaust ducts, single leaf dampers and plenums shall be fabricated from prime grade galvanized steel sheets of lock form quality and shall be constructed in accordance with appropriate tables of the latest ASHRAE "Guide and Data Book" and SMACNA "HVAC Duct Construction Standards" handbook and Chapter 6 of the 2022 CMC.
- B. Transverse Duct Joints shall be made with The Ductmate System. When using The Ductmate System, construction of the duct such as gage, reinforcing, etc. shall be as indicated in the latest addition of the applicable SMACNA standards. With proper data, an equal may be submitted, providing the corners have a downset and corner clips to insure airtight integrity. Testing must be done by a nationally recognized testing laboratory. The standard Ductmate 35 System joint is the equivalent of a SMACNA "J" connection. The Ductmate 25 System joint is the equivalent of a SMACNA "F" connection. The installation of the Ductmate System shall be in accordance with the latest manufacturer's printed Assembly and Installation Instructions.
- C. Each duct or plenum shall be diagonally cross-broken for rigidity.
- D. Duct bends, fittings, transitions, etc. shall be fabricated in accordance with Fabrication Standards as shown on the Drawings or in accordance with latest SMACNA "HVAC Duct Construction Standards" where not shown on Drawings.
- E. Support ducts to joists or similar structural members. Except where indicated otherwise, ducts with a side of 24" or more shall be supported on Ductmate trapeze duct hangers consisting of 2" high x 1-1/2" wide x 18" gauge channel and 3/8" diameter hanger rods hung from support brackets bolted to structural members. See also Special Fabrications as shown on the Drawings. Duct supports shall be eight (8) feet maximum on center.
- F. At branch ducts, provide manually operated dampers of the type and arrangement shown on the Drawings, two gages heavier than the duct (if single leaf type) in which installed, and equipped with locking quadrants and closed end bearings.
- G. Sizes shown on Drawings are net inside dimensions. Enlarge duct to accommodate lining.

2.6 ROUND DUCTWORK AND FITTINGS

- A. 2-10" w.g. round duct through 61" in diameter shall be United Sheet Metal spiral lockseam unseal duct, or approved equal, manufactured from galvanized steel meeting the ASTM A-527-71 in the following gages:

Diameter	Metal Thickness
3-13"	26 ga.

14-23" 24 ga.

- B. Round duct shall be new and exclusively obtained for this project. Each piece shall be in 20' lengths. Ducts shall be cut to length required with joints only at fitting locations, except on duct runs longer than 20 feet.
- C. Spiral duct and fitting connections, 15" diameter and larger shall be Ductmate Spiralmate round duct connectors. The connector system shall consist of two mating round duct connector flanges roll-formed from hot dipped galvanized steel with an integral sealant and closure ring roll-formed from hot dipped galvanized steel.
- D. Fittings shall be United Sheet Metal galvanized fittings in the following gauges:

Diameter	Metal Thickness
3-13"	24 ga.
14-23"	22 ga.
- E. Spiral duct fittings must be manufactured as separated fittings and shall not be saddle taps, stubs or tap-in fittings tapped into spiral duct, nor may they be dove-tailed tap-ins into pipe or fittings.
- F. Reducers shall occur after a branch tap occurs on the main portion of the fitting. Divided-flow fittings shall be used unless shown otherwise on the Drawings.
- G. Joints on ducts and fittings shall be covered and sealed with 4" wide, 6 oz. canvas saturated with Arabol lagging adhesive, or Hardcast DT tape in conjunction with Hardcast FTA-20, non flammable, non-toxic adhesive, or GlenKote duct sealer or other approved mastic type sealer. Duct tape will not be allowed. Where exposed to weather, paint lagging strips with two coats of silver enamel paint.
- H. All ductwork shall be constructed in accordance with appropriate tables of the latest ASHRAE "Guide and Data Book" and SMACNA "HVAC Duct Construction Standards" handbook and Chapter 6 of the 2022 CMC. Duct gauges to be in accordance with parts A and D of this section.
- I. At branch ducts, provide manually operated dampers of the type and arrangement shown on the Drawings, two gages heavier than the duct (if single leaf type) in which installed and equipped with locking quadrants and closed end bearings.

2.7 FLEXIBLE DUCT

- A. Flexible air duct shall be JP Lamborn Co., AMR-25. Flexible duct shall be factory made with a sound absorbing, spun-bonded, non-woven inner core. R-4.2 insulation to encompass core and a metalized polyester reinforced vapor barrier surrounding entire duct. Ends shall be secured to rigid duct per current SMACNA DCS with UL-181 FX tape. Length not to exceed 5 feet. Duct shall be Class 1, UL approved, and meet NFPA 90A, 90B and CMC minimum requirements.
- B. Use only the minimum length required to make the connection. In no case shall any section of flexible duct exceed 5 feet in length.
- C. Use two layers of UL listed 181 duct tape to connect flexible duct to the metal duct if flexible duct does not have S.M. collars.
- D. The number of bends shall not exceed a combined total of 90 degrees. 90 degree bends will not be allowed at diffuser connections.

2.8 DUCT SPECIALTIES

- A. Damper Regulators and Bearings: Duro-Dyne "Specline" SR-Series or approved equal, lever type with matching end bearing. Regulator set shall include rubber gasket between regulator and duct, spring washer between core and housing, wedge pin, dial indicator and handle. Matching end bearing shall be closed end with rubber gasket:

Model	Size
148	10" and Under
388	20" and Under
128	21" and Above

- B. Access Panels: Access panels shall be located at all points where adjustable mechanisms are installed internal to or on the surfaces of the ductwork. Where adjustable mechanisms are concealed by walls or ceilings, "Elmdor" or approved equal access doors shall be installed. Size shall be suitable for convenient servicing. Tile Walls: Doors and Frame: Stainless Steel. Other areas: recess type to receive ceiling or wall finish in order to provide "Blind Finish".
- C. Fire Dampers: Fire dampers shall be installed where shown on the Drawings and/or required, and shall be of a type approved by the U.L. Laboratories, Inc. and the State of California Fire Marshal. Dampers shall be installed per manufacturer's instructions. Provide access door in duct at each fire damper such that damper is easily accessible.
- D. Volume Dampers:
1. In rectangular ducts greater than 1.5 sq. ft., provide Pottorff Model CD42, or equal, factory fabricated opposed blade damper, 16 gauge blades, and brass bearings. Blade width shall not exceed six inches.
 2. In rectangular ducts 1.5 sq. ft. and less, provide single leaf dampers as described in Section 15600, 2.3 (a. and g.).
 3. In round ducts 15" in diameter and less, provide shop fabricated galvanized sheet metal plate dampers. Plate shall be 18 gauge or shall be two even gauges heavier than duct; minimum thickness 22 gauge. Provide stiffening beads at 1/3 points in dampers lighter than 18 gauge.
 4. In round ducts 16" and greater, provide Pottorff opposed blade damper Model CD22R or approved equal.
 5. In round ducts 4" – 24" in diameter, above "hard" ceilings, provide DuroZone Cable Operated Damper. Cable length to be between 3 and 15 FT long. Contractor to determine proper length to be use.
- E. Provide 20 gauge galvanized sheet metal escutcheon plates at duct penetrations of finished building surfaces. Install tight against surface and securely attached to duct. Continue insulation through openings.
- F. Duct Mounted Access Doors:
1. In rectangular duct provide, DuroDyne Model IAD, Ductmate "Sandwich", or equal, insulated, duct mounted access doors with Cam-Lock operated latches where shown on drawings or required for access to duct mounted equipment. Doorframe shall be 24-gauge with double wall door and 1/2" glass fiber insulation. Size doors to provide easy access to equipment.

2. In round ducts, provide Ductmate - METU round duct access doors, fully insulated, with attached gasket and springs between inner and outer door. Access doors shall be as large as practical as duct size will allow.

2.9 FLEXIBLE CONNECTIONS

- A. Provide fireproof, insulated, non-porous, flexible connections between fans and ducts or casings and where ducts are of dissimilar metals. For round ducts, securely fasten flexible connections by zinc coated steel clinch-type drawbands. Flexible connections shall be DuroDyne "Insulfab" or "Insulflex" or approved equal.
- B. Provide a duct support next to each flex connector to prevent any strain on connection.

2.10 CONDENSATE DRAINS AND DRAIN PANS

- A. Air conditioning cooling coils shall have a condensate drain pipe, type "M" copper, to drain the condensate as shown on drawings.
- B. Fan coils or DX cooling coils located in an attic or furred space shall have a water level detecting device that will shut off the equipment or appliance in the event the primary drain is blocked.
- C. Alternately, Fan coils or DX cooling coils located in an attic or furred space shall have a secondary drain pan constructed of 20 gauge galvanized steel sheet metal. This pan shall have a drain line discharging to a conspicuous location. This pan and drain is in addition to the normal condensate drain line from the coil.

2.11 PIPE HANGERS AND SUPPORTS

- A. In general, pipe hangers and supports shall conform to the following except where special pipe hangers and supports are detailed on the Drawings. In cases hanger and support details on the Drawings shall take precedent over the following:

Pipe 6" Size and Smaller	
Items	Superstrut Number
Pipe Hanger	710
Side Beam Clamp for Wood Joist	540
Beam Coupling for Steel Beams	U563-U562
Rod Coupling for Connection to "Hilti"	H-119
Inserts in Concrete Decks	
Trapeze Hangers	A1200-A1202
Pipe Clamp	A716 or 701W/S-716

- B. Similar items by Unistrut, Securstrut, Michigan, or B-Line will be acceptable.
- C. Hanger Rods shall conform to the following table:

Tube/Pipe Size	Rod Diameter
1/2" to 4"	3/8"

- D. Hanger Support Spacing shall be as follows unless shown otherwise on the Drawings:

1. Horizontal:
 - a. Copper: Every 6 feet for 1-1/2 inch and smaller, and 10 feet for 2 inch and larger.

- b. Steel, Gas: Every 6 feet for 1/2 inch, 8 feet for 3/4 inch and 1 inch, and 10 feet for 1-1/4 inch and larger.

2. Vertical:

- a. Copper: Every floor not to exceed 10 feet.
- b. Steel, Gas: Same as horizontal spacing except 1-1/4" and larger at every floor.

2.12 DUCT SMOKE DETECTORS:

- A. HVAC systems rated at 2000 CFM or greater shall be equipped with a duct smoke detector to automatically shut off the HVAC system if smoke is detected.
- B. The detectors shall be installed in the main supply duct downstream of any filters, before any branch ducts or terminal connections.
- C. The detector shall be System Sensor Innovairflex D4120 4-wire Photoelectric Smoke Detector. Provide with Factory NEMA 4 enclosure if mounted outside.

2.13 DAMPER ACTUATORS

Provide actuators as specified in the mechanical control drawings. If actuators are not specified in the mechanical control drawings or in the mechanical legend or detail drawings, then the following shall be used:

- A. Actuators shall be Belimo. Actuator shall be direct coupled over the shaft, spring return type.

2.14 ELECTRICAL EQUIPMENT

- A. Motor starters shall be provided complete with properly sized thermal overload protection and other appurtenances necessary for motor control specified. Mount starter adjacent to equipment. See electrical drawing. Maintain minimum of 3' clearance to front of device.
- B. Motor Starters: Shall be NEMA I or III as appropriate, general purpose, weather-resistant, with watertight enclosure where required.

2.15 INSULATION

- A. General: Insulation and lining material shall meet requirements of flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by Procedure ASTM-E-84, NFPA 255 or U.L. 723 and shall conform to NFPA 90A and 90B.
- B. Heating and cooling duct and related heating and cooling equipment insulation shall conform to 2022 Building Energy Efficiency Standards, Administrative Regulations, Title 24, Part I, Section 120.4, except to the extent that this Specification supersedes the minimum standards as established by the Code, in which case this Specification shall take precedent.
- C. Unless noted otherwise, insulation shall be Fiberglass, or approved equal material. Application Work shall be performed in accordance with the best accepted practice of the trade and the manufacturer's recommendations. The performance of insulation Work shall be by experienced insulation applicators. Insulation shall be installed after the specified tests have been applied to the piping and duct systems, and the systems have been inspected and approved. Fiberglass trade names and/or numbers have been used to establish a standard of quality.
- D. External Duct Insulation – Outdoors, in a space between the roof and an insulated ceiling, in a space directly under a roof with fixed vents or openings to the outside or unconditioned spaces, in

an unconditioned crawlspace; or other unconditional spaces: Shall be applied to concealed heating and cooling, supply and return duct except duct that is internally lined. Insulation on duct shall be Manville Microlite FSK duct insulation, 3" thick, minimum installed R value of 8.0 or greater, FSK aluminum foil reinforced with fiberglass, scrim laminated to U.L. rated Kraft, or approved equal. Adhere to duct surfaces with Foster's 85-62 or approved equal, adhesive applied in strips of 6" wide on approximately 12" centers. Circumferential seams shall be butted together and sealed over joints with 3" wide pressure sensitive foil vapor barrier tape. Longitudinal edges shall be lapped 2" and secured with outward clinching staple 6" on center then sealed with pressure sensitive foil vapor barrier tape. Duct wrap shall be installed to allow maximum fullness at corners (avoid excessive compression) minimum thickness at corners shall be 1". Where ducts are over 24" in width, the duct wrap shall be additionally secured to the bottom of the rectangular ducts with mechanical fasteners spaced on 18" centers (Max.) to prevent sagging insulation.

- E. External Duct Insulation – All other locations not listed above: Shall be applied to concealed heating and cooling, supply and return duct except duct that is internally lined. Insulation on duct shall be Manville Microlite FSK duct insulation, 2" thick, type 100, minimum installed R value of 4.2 or greater, FSK aluminum foil reinforced with fiberglass, scrim laminated to U.L. rated Kraft, or approved equal. Adhere to duct surfaces with Foster's 85-62 or approved equal, adhesive applied in strips of 6" wide on approximately 12" centers. Circumferential seams shall be butted together and sealed over joints with 3" wide pressure sensitive foil vapor barrier tape. Longitudinal edges shall be lapped 2" and secured with outward clinching staple 6" on center then sealed with pressure sensitive foil vapor barrier tape. Duct wrap shall be installed to allow maximum fullness at corners (avoid excessive compression) minimum thickness at corners shall be 1". Where ducts are over 24" in width, the duct wrap shall be additionally secured to the bottom of the rectangular ducts with mechanical fasteners spaced on 18" centers (Max.) to prevent sagging insulation
- F. Internal Duct Insulation - Outdoors, in a space between the roof and an insulated ceiling, in a space directly under a roof with fixed vents or openings to the outside or unconditioned spaces, in an unconditioned crawlspace; or other unconditional spaces: Shall be applied to all heating and cooling supply and return duct and plenums on roof or where shown on Drawings. Manufacturer shall be Manville Microlite, or approved equal. Duct Liner shall be Linacoustic R, 2" thick, 1.5 pcf, with a "K" value of 2.2 in. for a total "R" installed value of 8.0 or greater. Insulation shall withstand velocities of up to 5000 FPM and temperatures up to 250 degrees F.
- G. Internal Duct Insulation – All other spaces not listed above: Shall be applied to all heating and cooling supply and return duct and plenums where shown on Drawings. Manufacturer shall be Manville Microlite, or approved equal. Duct Liner shall be Linacoustic R, 1 ½" thick, 1.5 pcf, with a "K" value of 2.2 in. for a total "R" installed value of 4.2 or greater. Insulation shall withstand velocities of up to 5000 FPM and temperatures up to 250 degrees F
- H. Portions of duct receiving Duct Liner shall be completed with transverse joints neatly butted with no gaps or interruptions. The duct liner shall be adhered to the sheet metal with 100% coverage of adhesive and exposed leading edges and transverse joints coated with adhesive. Adhesive shall be a water based product. In addition this shall be secured with mechanical fasteners which shall compress the liner sufficiently in place. The liner shall be cut to assure overlapped and compressed longitudinal corner joints. Application procedures shall comply with the recommendations of the Sheet Metal and Air Conditioning Contractor's National Association's Duct Liner Application Standard, Second Edition.

- I. Ducts: Ducts shall be constructed, installed, sealed and insulated in accordance with the 2022 CMC. Insulation requirements are shown in 2022 California Energy Code T-24 Part 6 Section 120.4. The above paragraph(s) shall supersede if more stringent.

2.16 TEMPERATURE CONTROLS

- A. Temperature controls shall be furnished as indicated in schematic Drawing on Plans including room thermostats, relays and other necessary combustion, operating and safety controls.
- B. Wiring and Conduit
 - 1. Control wiring and conduit shall be the responsibility of this section and be installed as follows:
 - a. In equipment rooms/attics – Conductors shall be run in conduit. Final connection to equipment shall be flexible conduit.
 - b. Concealed in building construction (wall/inaccessible ceilings) - Conductors shall be run in conduit.
 - c. Roof mounted/exterior equipment yards – Conductors shall be in conduit. All flexible conduit shall be seal-tite with weatherproof connections. Equipment on grade and detached from the building a distance greater than 36" shall have underground control conduit routed to equipment.
 - d. Above accessible ceiling spaces – Control cable will be allowed to be installed without conduit in accessible areas above ceilings as follows:
 - 1. Cable is an approved type for the application.
 - 2. Cable is bundled/organized in management devices routed square with building lines (no diagonals) and kept clear of electrical devices (i.e., ballasts, transformers, etc.) that could cause interference.
 - 3. Conduit sleeves are provided between accessible ceiling spaces (i.e., across soffits, gypboard ceilings, etc.) as required to maintain future access to cable.
 - e. Cable routed in accessible ceiling spaces shall comply with EIA/TIA standards for communications cabling. Communication bus wire shall be W183C-2058Y Connect Air, yellow shielded cable.
- C. Electric wiring, conduit and other electric devices required to complete the installation of the temperature control systems shall comply with requirements as set forth in the Electrical Section of this Specification.
- D. After completion of the installation, the Contractor shall adjust thermostats, motors and other equipment provided under this Contract. He shall place them in complete operating condition subject to approval of the Architect.
- E. The Control System herein specified shall be free from defects in workmanship and material under normal use and service. If, within twelve (12) months from date of acceptance by the Architect, any of the equipment herein described is proved to be defective in workmanship or material, it will be adjusted, repaired or replaced free of charge by the Contractor.
- F. The final connections and supervision of control wiring and interlock wiring shall be the responsibility of this Contractor.

- G. The Contractor shall submit to the Architect for approval, the required number of shop drawings of the entire control system before starting Work.
- H. Upon completion of the Work, the Contractor will provide diagrammatic layouts of the Automatic Control Systems specified herein. Layouts shall show control equipment and the function of each item shall be indicated.
- I. The temperature control system shall be installed by persons in the direct employment of the temperature controls manufacturer(s) exclusive contracting representative. The Mechanical Contractor shall not install the temperature controls unless pre-approved by the Mechanical Engineer.

2.17 REFRIGERANT PIPING

- A. Refrigerant piping shall be flushed clean with nitrogen and the ends capped prior to installation. Refrigerant piping shall be ASTM B280 ACR copper tube with wrought copper fittings. All piping and components are to be rated for R32 / R454B pressures. Use 5% minimum silver brazing alloy with melting point higher than 1100°F for making the joints.

2.18 REFRIGERANT PIPING INSULATION

- A. Heat Pump Systems:
 - 1. Material:
 - a. Low-density EPDM closed cell elastomeric foam, CFC and HCFC gas free with over-lap seal
 - b. Thermal Conductivity: 0.235 (BTU * in/h *ft² * °F) at 75°F.
 - c. Water Vapor Permeability: <0.03 perm (4.38 x 10⁻¹¹g/Pa*s*m) per ASTM E96.
 - d. Water Absorption: <0.2% by volume per ASTM C 209.
 - e. Working Temperature: -70 °F to 257 °F (-57 °C to 125 °C) continuous per ASTM C 411.
 - f. Surface Burning Characteristics: Meets 25/50 Flame-Spread/ Smoke-Generated per UL 723 and ASTM E84. Additionally, meets UL-94 5 V-A, V-0 and is self-extinguishing per ASTM D 635.
 - g. UV Resistant: EPDM provides UV Resistance in accordance with ASTM G7/G90.
 - h. Ozone Resistant: Meets ASTM D 1171
 - 2. Title 24 Wall Thickness:
 - a. Liquid pipes:
 - 1. 1" wall thickness
 - b. Suction gas pipes:
 - 1. 1" wall thickness for less than 1" pipe
 - 2. 1 1/2" wall thickness for greater than 1" pipe
- B. For insulated piping located outside the exterior envelope of the building and/or exposed to weather:
 - 1. Provide with aluminum or metal jacketing/cladding installed per manufacturer's recommendations.

2.19 REFRIGERANT PIPING ACCESSORIES

- A. Stop valves shall be Henry Type – rated for R410A, brass body, soldered, packless diaphragm.
- B. Solenoid valves shall be Sporlan Type – rated for R410A, soldered with brass body.
- C. Filter dryer shall be Sporlan "Catch-All" with soldered connections.
- D. Flexible connectors rated for R410A shall be used at seismic joints. For linesets up to 5/8", flexible connectors shall be 36" Flex-Line Connectors manufactured by DiversiTech Corporation. Contractor to provide nitrogen purge and cleaning of complete assembly prior to installation.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the Work of those trades for interface with the Work of this Section.

3.3 PREPARATION

- A. Holes in concrete:
 - 1. Provide sleeves, accurately dimensioned and shaped to permit passage of items of this Section.
 - 2. Deliver such sleeves, with accurate setting drawings and setting information, to the trades providing the surfaces through which such items must penetrate, and in a timely manner to assure inclusion in the Work.
- B. Flashing:
 - 1. Where items of this Section penetrate the roof, outer walls, or waterproofing of any kind, provide under this Section base flashing and counterflashing required at such penetration.
 - 2. Provide on each pipe passing through the roof a 4 pound seamless lead flashing and counterflashing assembly.

3.4 GENERAL INSTALLATION REQUIREMENTS

- A. Conceal piping, ductwork, and equipment in spaces provided unless specifically shown otherwise. If spaces are inadequate, notify Architect in time to avoid unnecessary Work. Do not cut or notch structural members without specific approval of the Architect.
- B. Follow manufacturer's instructions on items not specifically covered in drawings and specifications. Report discrepancies to Architect for clarification before starting Work.

3.5 EQUIPMENT INTERFACE

- A. Provide required shut off valves, unions, and final connections of piping to the Work of this Section.

- B. For electrically operated equipment, verify the electrical characteristics actually available for the Work of this Section and provide equipment meeting those characteristics.

3.6 PAINTING

- A. Paint inside of air outlets and connecting plenums with one coat of black paint, or provide all such items factory prepainted.
- B. For roof-mounted equipment, provide factory pre-finish on exposed surfaces.
- C. Touch-up scratches and abrasions to be invisible to the unaided eye from a distance of 5 feet.

3.7 INSTALLATION OF DUCTWORK

- A. Ductwork shall be delivered to the Project site with surfaces clean and free of loose dirt and rust. Special care shall be exercised by the Contractor to store the duct in a clean area to prevent the accumulation of dirt prior to installation. Fabricated or partially fabricated duct sections shall not be stored in open fields or on dirt areas surrounding the construction site. Paved areas may be used, if available, provided adequate protection is provided to prevent the accumulation of dirt on duct surfaces. If possible, the Contractor should arrange to deliver duct to the project site and store on the floor of the area in which it is to be installed.
- B. Before installation of ductwork, the Contractor shall inspect each section of duct and wipe internal surfaces clean. At the end of each Work period, or when ends of duct are left installed for future extension, the open ends shall be tightly closed off with a plastic sheet and taped securely to the open end of the duct.
- C. Construct and install sheet metal in accordance with latest SMACNA recommendations. Provide variations in duct size and additional duct fittings as required and approved by the Architect at no extra cost to the owner.
- D. The throat radius of bends shall be 1-1/2 times the width of the duct. Provide turning vanes in any mitered turn greater than 45 degrees.
- E. Transition slopes shall be no less than one to five where space permits.
- F. Abrupt offsets in the duct system greater than 30 degrees will not be allowed.

3.8 TEMPERATURE CONTROL INSTALLATION

- A. Install wiring and tubing parallel to walls and floors and securely clipped to structure or mechanical system components. Group parallel runs for neat appearance.
- B. Install room thermostats and other control devices at 48 inches above finished floor unless a lower mounting height is required for access by handicapped.
- C. Install outside air sensor in a location where it is not directly effected by radiation from the sun or any heat generating device or by a conditioned air stream or any other location that would produce a false reading.
- D. Upon completion of the installation calibrate all equipment and adjust controls for proper operation.

3.9 REFRIGERANT SYSTEM CHARGING PROCEDURE

- A. Pressurize the system with refrigerant and hold for 24 hours with no drop in pressure; test joints and equipment for evidence of leaks after satisfactory pressure test.

- B. Provide 1/2" angle type charging and purging valves adjacent to high and low side of the condensing unit to accomplish the procedure described hereinafter. Connect the vacuum pump to both the high and low side of the system. Do Work when ambient air temperature is above 60 degrees F during the evacuation process.
- C. Operate the vacuum pump until the system is evacuated to 2.5 mm Hg absolute. Break the system vacuum with nitrogen or refrigerant.
- D. After the system has been evacuated to 2.5 mm Hg absolute, close the vacuum pump suction valve and stop the pump.
- E. Charge system to required capacity with specified refrigerant.

3.10 CONTROL DEVICE IDENTIFICATION LABELS

- A. Thermostats and Exhaust fan switches shall have labels mounted on or just above the control device labled with the equipment being controlled. As an example, for a exhaust fan controlled by a switch the lable would read "EXHAUST FAN # 1" or if a thermostat the label would read "AC-1".
 - 1. Labels shall be 2" x 1" x 1/8" thick Formica/plastic engraving stock beveled on both sides and with two 3/16" diameter holes near the top uppermost tag corners.
 - 2. Labels shall be white with 3/8" high red engraved letters.
 - 3. Labels shall be attached to the equipment with adhesive.

3.11 WARRANTY

- A. The contractor shall warranty all of the systems for proper operation installed by the contractor for not less than one calendar year from date of project completion. This completion date shall be set by the Architect or owner.

3.12 SHOP DRAWINGS

- A. The Contractor shall prepare shop drawings covering mechanical duct systems, equipment, and piping systems. The drawings shall be prepared electronically at 1/4" / ft scale minimum (or greater as needed for clarity or as requested by the Architect or Mechanical Engineer) and shall include sections, elevations, and dimensions in relation to the building structure and other trades as required to demonstrate coordination with all other disciplines and trades on the project.
- B. Shop drawings are to be submitted to the Architect for approval per the Submittals requirements of this section prior to any fabrication.

3.13 MECHANICAL SYSTEM START-UP RESPONSIBILITY

- A. Start up Mechanical Systems, and perform any such Work as may be required to adjust the systems to meet the requirements of the Contract Documents.
- B. Install new clean specified filters in equipment containing filters immediately prior to owner occupancy. Contractor to bear all costs for this work.

3.14 MECHANICAL SYSTEMS BALANCING

- A. Testing and air balancing shall be performed by an independent balancing company certified by Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) or other ASHRAE recognized TAB specific certification. Testing and balancing shall be performed by a

company other than the mechanical system installers/contractor. Service provider credentials to be included with project submittals for approval by the Mechanical Engineer.

- B. After Systems have been tested as outlined, air and water flow rates shall be balanced, and control devices adjusted. Balance and testing shall not begin until systems have been completed and are in full working order. Upon completion of the balancing operation and prior to final acceptance of the systems, the balancing firm shall submit a report, per the Submittals requirements of this section, certifying to the proper performance of the system for approval by the Mechanical Engineer.
1. The following information shall be included in the Air Side Report:
- a. Fan speeds.
 - b. Motor current readings and voltage readings.
 - c. Air quantities in CFM at supply, return, exhaust terminals, and outside air intakes, both at design value and actual measured value. Test and adjust each terminal to within +10% of design requirements.
 - d. Air velocities in FPM at supply, return, and exhaust terminals at design value and actual measured value.
 - e. Positive static pressure, negative and total pressures and total air quantities for each fan system.
 - f. Equipment nameplate data.

END OF SECTION 230000 - HVAC

SECTION 230500 – COMMON WORK RESULTS FOR MECHANICAL**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Related Documents:
 - 1. The other Contract Documents complement the requirements of this Section.
 - 2. Division 1 - General Requirements applies to the Work of this Section.
 - 3. Where requirements of this Section exceed those in other Contract Documents, Contractor shall comply with the requirements of this Section.
- B. Codes and Regulations:
 - 1. In addition to complying with the specified requirements, comply with pertinent regulations of governmental agencies having jurisdiction.
- C. Included: Work includes, but is not limited to the following:
 - 1. Heating, Ventilating, Air Conditioning and System Balancing
 - 2. Plumbing
 - 3. Fire Protection
 - 4. Carpentry and metal Work required for Work of this Section and not specifically shown under another Section. Openings in concrete or masonry construction shall be either core drilled or saw cut unless indicated otherwise on Drawings.
 - 5. Excavation and Backfill
 - 6. Coordination Drawings
- D. Related Work:
 - 1. Painting (Division 09)
 - 2. Cutting and Patching (Division 30)
 - 3. Low voltage electrical control (Division 26)

1.2 DEFINITIONS

- A. Furnish: Purchase and deliver to job site in new condition.
- B. Install: Receive and store at job site until required; place secure and connect; furnish required appurtenances.
- C. Provide: Furnish and install as defined above.
- D. Section: Refers to a Section of these Specifications.
- E. Standards: The issue in effect as of the date of the contract documents.

1.3 PROJECT RECORD DRAWINGS

- A. Comply with pertinent provisions of Architectural Sections (Division 01).

1.4 SERVICE INTERRUPTIONS

- A. When Work of this Section requires temporary shutdown of existing systems for connections, the shutdown shall be made only during pre-arranged time agreeable to the Owner.

1.5 CORRELATION, INTERPRETATION AND INTENT OF CONTRACT DOCUMENTS

- A. The Mechanical Drawings are, in general, made to scale and the Contractor may obtain approximate distances and dimensions by scaling the Plans. It is distinctly understood, however, that it is done entirely at the Contractor's responsibility. Refer to Architect's Plans and Specifications for construction details, which will affect the Work and equipment. Examine the Architectural, Civil, Structural, Mechanical, Electrical, Landscape, Irrigation, Data, Fire Protection and Plumbing Plans and Specifications to ensure that this work does not conflict with the above trades. Plumbing, Mechanical and Electrical Plans are diagrammatic and, therefore, do not necessarily represent the exact installation. However, pipe sizing for utility services and ductwork are calculated per their respective codes and Standard Engineering Practice and shall be installed as sized from point of origin to terminal point. It shall remain the Contractor's responsibility to submit Shop Drawings if he/she has any questions about the final arrangement. Nothing on these Plans or Specifications shall be construed to permit work not conforming to all applicable codes and regulations.

PART 2 - PRODUCTS

2.1 ACCESS PANELS

- A. If not called for under other Sections, furnish Milcor, Elmdor, or Jay R. Smith access panels where shown on the Drawings or required for maintenance access to completed Work of this Section. Submit size, type, and location of proposed access panels not specifically shown, for review by Architect.
- B. Access panels shall be constructed of 16 gauge prime coated steel or stainless steel with screwdriver operated cam latch, concealed hinges, and fire rating equal to adjacent construction.
- C. Provide flush type doors with:
 - 1. Stainless steel finish for tiled surfaces.
 - 2. Prime coated finish for other surfaces.

2.2 FLASHING

- A. Provide watertight flashing at all openings through exterior walls and roof. Refer to Architectural Drawings.

2.3 VIBRATION ISOLATION AND NOISE CONTROL

- A. All fans, heating and ventilating units, air conditioning units, blowers and similar equipment shall be securely mounted to and/or supported from the structure.
- B. Isolate all bare water piping from structural members or hangers with "Trisolators" or submitted and approved equal insulating sleeves. Install hangers on outside of insulated jacket on all insulated lines.

2.4 WEATHERPROOFING

- A. All equipment exposed to weather shall be protected by means of a suitable finish (i.e. paint). All fan cabinets, roof-mounted equipment, and ductwork shall be fabricated in such a manner to prevent leakage through seams and joints. Water rated, exterior hoods shall be provided over motors, belts,

and other devices to insure against damage by water. At all locations where pipes and/or ducts penetrate exterior walls, or roofs, suitable rain tight flashing shall be provided.

2.5 PIPE WRAPPING

- A. All pipe, metal components, and joints buried in ground shall be primed and protected with 10-mil tape double wrapped or approved equal per IAPMO IS 13-2006. Before tape application, all bare pipe and fittings to be wrapped must be coated with pipe wrap primer. Stretch first layer of tape to conform to the surface while spirally half-lapping, apply a second layer, half-lapped and spiraled as the first layer with spirals perpendicular to first wrapping. In lieu of tape wrap, heat shrinkable 10-mil minimum thick polyethylene sleeve may be used.
- B. When applying tape, use only enough pull to cause the tape to properly conform to the irregular surfaces of the item. The proper amount of pull is reached when the tape surface is smooth without any wrinkles. Continue tape 4" above grade. End overlaps should point down. Tape shall be applied per manufacturer's installation instructions.

2.6 ELECTRIC MOTORS AND ELECTRICAL DEVICES

- A. All Electric motor current characteristics are as shown in equipment schedules on drawings and as specified hereinafter in this Specification. The Contractor shall refer to the Electrical Plans and shall confirm all motor voltage, amperage and phase characteristics before processing submittals or ordering equipment. If any equipment is installed different from the supplied electrical power, it is the contractor's responsibility to correct equipment to the required electrical characteristics.
- B. All electrical devices of a type normally listed by Underwriters Laboratories, Inc. shall bear U.L. label of approval.

2.7 PAINTING AND FINISHING

- A. Provide the coating specified below unless otherwise specifically called for under Painting, Division 090600. Exclude non-ferrous items, stainless steel, items to be insulated, and factory-finished items. Conform to requirements of the Painting Section where requirements are not specified in this Section.
- B. All materials used, except as otherwise specified in carrying out the provisions of the contract, are to be Fuller-O'Brien manufacturer or approved equal. Numbers given below are Fuller-O'Brien Company designation unless noted otherwise.

1. Primer coat for all exterior and interior materials: 1 Coat - Primer #66850
2. Finish coats as listed below:

Interior of Grilles, Diffusers, and Registers	1 Coat – Flat (black) #31202

3. Furnish equipment with factory or field-applied prime coat and finish coat of enamel. Restore damaged finishes to match original.

PART 3 - EXECUTION

3.1 GENERAL EQUIPMENT INSTALLATION REQUIREMENTS

- A. Install equipment to provide neat appearance, required manufacturer's access, and required space to allow replacement or maintenance. Provide bases, supports, anchor bolts, and other items required to install equipment. Installation shall be level and braced per CBC.

- B. Equipment shall operate quietly and without objectionable vibration. Excessive vibration, other than from specified equipment operating at optimum conditions, shall be the Contractor's responsibility and shall be eliminated as directed by Architect.

3.2 COORDINATION OF WORK

- A. Coordinate Work of this Section with Work of other Sections to avoid conflicts. If required, provide shop drawings and submit to Architect for approval.
- B. Insure that Work of other Sections is suitable to accommodate Work of this Section.

3.3 ADEQUACY OF FURRING

- A. Conceal piping and ductwork in spaces provided unless specifically shown otherwise. If spaces are inadequate, notify Architect prior to ordering materials and fabrication of components.

3.4 PROTECTION AND CLEANING

- A. Protect equipment from dirt, moisture, and mechanical damage during construction. Restore or replace damaged equipment to original condition.
- B. Keep interior of piping and ductwork free of foreign material during construction. Flush piping systems with test medium specified under Piping Tests before installing equipment and appurtenances or making final connections.

3.5 CLOSING-IN OF UNINSPECTED WORK

- A. Do not conceal or cover Work before tests and observations are completed. Uncover Work prematurely closed in and repair resulting damage to all Work, if requested by Architect, Engineer, or Project Inspector.

3.6 DAMAGE

- A. Repair or replace items damaged by leaks or overflow from Work provided under this Section and for any damage to any part of the project site, for a period of 1 year after notice of completion date. This is in addition to and not a limitation of other rights the Owner may have against the contractor under the Contract Documents.

3.7 PAINTING AND FINISHING

- A. Exposed piping, ducts, and mechanical equipment (except for factory finished items) shall be painted. Exposed piping, except for identification banding, shall be painted to match surfaces adjacent. Each coat to be inspected when dry and subsequent coat not to be applied until approval received.
- B. Paint all surfaces visible through grille, diffuser and register faces, flat black.
- C. The contractor shall store all painting materials and equipment outside of the building. The receiving and moving of all paint materials and mixing shall be done outside of the building. Any other arrangements shall be made only with Architects approval.
- D. All necessary precautions shall be taken to prevent fire. Rags, waste, etc., soiled with paint or cleaning material, shall be removed from the premises at the end of each day's work.

3.8 MECHANICAL SYSTEM TESTING

- A. Furnish all test pumps, gauges, and equipment. Test all safety controls and devices.
- B. For air tests, install a calibrated test pressure gauge in the piping system to observe any loss in pressure. Calibrate the test pressure gauge with a dead weight tester within 15 days before use and certify by initial and date on a sticker applied to the dial face. Maintain the required test pressure for

the time indicated. Brush joints with a soapy water solution to check for leaks if the required pressure cannot be maintained.

- C. After any test, repair all leaks found as directed and re-test as necessary until the system is proven tight.
- D. Before applying test pressure to any piping systems the Contractor shall be responsible for isolating all equipment e.g. control valves, regulators, relief devices, tanks and any other line accessories, which would otherwise be damaged by the test pressure.
 - 1. Soil, Waste, Vent, Roof, and Condensate Drainage:
 - a. Entire System: Tightly close all openings except the highest one. Fill to overflowing with water.
 - b. Sections of System: Tightly close all openings except the highest opening of the section under test. Fill section with water to test each section with a minimum 10-foot head of water except for the uppermost 10 feet of the system.
 - c. Allow to stand for (4) hours or longer, as required to complete the inspection.
 - 2. Domestic Water: Fill with water and test at 150 psig. Retain for (4) hours.
 - 3. Refrigerant: Pressurize the system with nitrogen to 150 psig and hold for 24 hours with no drop in pressure; test joints and equipment for evidence of leaks after satisfactory pressure test.
- E. After all Systems have been tested as outlined, all flow rates shall be balanced, and all control devices adjusted. See Section 230000.
- F. The equipment and installations shall be operated by the Contractor and he shall demonstrate that all Systems are performing according to the requirements of the Plans and Specifications and to the satisfaction of the Architect, Engineer and Owner.
- G. Acceptance Testing Requirements: For applicable mechanical acceptance tests see the T-24 plan sheets. All forms, regulation and requirements are available online at www.energy.ca.gov/title24.

3.9 CUTTING AND PATCHING

- A. The Contractor shall do all cutting and patching which may be required for the installation of the Work under this Division of the Specifications. Patching shall be of the same quality, materials and finish as, and shall match accurately, all surrounding construction. No cutting of the Structure shall be permitted without the approval of the Architect.
- B. Wherever concrete or paved surfaces are cut to provide for the installation under this Section, the Contractor shall restore the surfaces to their original condition. Subgrade materials, concrete, and paving materials, along with the placement of same, shall be in accordance with the respective Sections of this Specification as they apply to the installation of such material.

3.10 INSTALLATION OF PIPING, DUCTWORK AND EQUIPMENT

- A. The installation of piping, ductwork, and equipment shall be made in such a manner to clear beams and obstructions. Do not cut into or reduce the size of plates or any load carrying members without approval of the Architect. Check Drawings and Work of others to prevent interference. Deviations of the Work determined by the Architect shall be installed by the Contractor without additional cost.

- B. Install piping and ductwork promptly, cap or plug open ends of pipe. No piping shall be permanently covered by construction before inspection and approval. Piping and ductwork shall be installed in accordance with best practice and recommendations of the manufacturer.
- C. Conceal piping and ductwork unless indicated otherwise. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions. Remove defective material from site. Install piping at a generally level, free of traps and unnecessary bends to conform with building requirements and provide space for other work. Piping to be free of unusual noises. Avoid any possible galvanic action by isolating dissimilar metals with suitable Dielectric Insulating Fittings.
- D. Unless called for otherwise, hereinafter in this Specification or by specific detail on the Drawings, all water pipes in contact with structure and/or hangers shall be suitably isolated. In the case of uninsulated pipe, "Trisolators" or equal shall be used.
- E. Protect enameled or polished equipment from damage, tool marks, etc.

3.11 EQUIPMENT IDENTIFICATION TAGS

- A. Major pieces of equipment shall include, but are not limited to: water heaters, air conditioners, unit heaters, supply and exhaust fans, and shall be tagged.
 - 1. Tags shall be 2" x 2" x 1/8" thick Formica/plastic engraving stock beveled on both sides and with two 3/16" diameter holes near the top uppermost tag corners.
 - 2. Tags shall be white with 3/8" high red engraved letters.
 - 3. Tags shall be attached to the equipment with bolts, screws or chains as per valves.
 - 4. Tags shall have the following information:
 - a. Equipment number and nomenclature corresponding to the information on the mechanical contract drawings, and where multiple systems are installed in a building, equipment tagging shall include the space or area served.
 - b. Examples:

WATER HEATER	EXHAUST FAN	AIR CONDITIONER
WH-1	EF-2	AC-3
FIRST FLOOR	KITCHEN 101	2ND FLOOR OFFICE - EAST

3.12 IDENTIFICATION OF PIPING SYSTEMS

- A. Building Systems:
 - 1. Piping systems installed anywhere within the scope of the Work shall be identified as to contents using a color banding and marking system as outlined and in compliance with Federal OSHA requirements.
 - 2. This Work includes furnishing and application of all snap-around and/or self-sticking pipe markers. Formica valve tags, chains, wires, and related materials proper for the completion of the Work.
 - 3. Pipe markers shall be permanently shaped vinylite plastic snap-around pipe markers as manufactured by Seton Nameplate Corporation, Wilmington Plastic Company, or approved equal.

4. Background colors shall be used and shall conform to the ANSI/ASME A13.1 color scheme, lettering size, length of color field, and viewing angles of identification devices. The names of materials (pipe contents) shall be superimposed on these ANSI background colors. Work legends shall conform to ANSI A13.1 to avoid confusion and mistakes. Basic background colors and content classification are:

Red	Fire Quenching Fluids
Orange	Toxic or Corrosive Fluids
Yellow	Flammable Liquids
Brown	Combustible Fluids
Green	Potable, Cooling, Boiler Feed, Other Water
Blue	Compressed Air
Purple	Defined by User, Non-Potable Water

5. Pipe marking and installation shall be as follows:
- Apply "Plastic Pipe Marker" at each valve to show proper identification of pipe contents.
 - Use an "Arrow Marker" with each "Pipe Content Marker". The Arrow shall always point away from the "Pipe Marker" and in the direction of the flow.
 - If flow can be in both directions, use a double-header "Arrow Marker".
 - Apply "Pipe Marker" and "Arrow Marker" at every point of pipe entry and exit where the line goes through the wall, floor or roof.
 - Apply "Pipe Marker" and "Arrow Marker" on each riser and "T" joint.
 - Apply "Pipe Marker" and "Arrow Marker" every 50 feet on long continuous lines.
 - Identifying long continuous lines with "Pipe Marker and "Arrow Marker at every bay or aisle within the building. All branch runs from mains on the roof shall be identified with "Pipe Marker" and "Arrow Marker" at the point of takeoff.
 - Apply "Markers" on the two lower quarters of the pipe where view is unobstructed. In this position "Markers" are read at a glance from ground floor level and dust will not obscure the "Marker". Roof-mounted piping "Markers" shall be so located that they can be read from a standing position on the roof.
 - All identification markers located out of doors and exposed to the sun and the elements shall receive one coat of clear lacquer after application to the pipe, to seal edges and to act as a protective coating.
 - Each "Arrow Marker" must have the same ANSI background color as its companion "Pipe Marker". Arrow must point away from "Pipe Marker" and indicate direction of flow.
 - "Pipe Markers" shall be guaranteed to stay on pipe systems for a period of not less than five years.
6. Following is a list of, but not necessarily limited to, the more commonly used piping systems that require identification "Pipe Markers" and "Arrow Markers".

Abbreviations on Drawings	Wording to Put on Pipe Marker	ANSI Color Background
NP	Non-Potable Water	Purple
CW	Domestic Cold Water	Green
DHWS	Domestic Hot Water Supply	Green
DHWR	Domestic Hot Water Return	Green
S	Gravity Sewer or Drain	Green
V	Vent	Green
FM	Fire Protection Water	Red
RL	Refrigerant Liquid	Orange
RS	Refrigerant Suction	Orange
All text lettering shall be black on the white, yellow, and orange backgrounds. White text lettering shall be on all other background colors.		

3.13 OPERATION AND INSTRUCTION

- A. The Contractor shall furnish competent Technicians to supervise start-up operations of equipment specified by the Architect or Engineer and to instruct Owner's operators. The Contractor shall furnish six complete sets of operating instructions and service manuals to the Architect.
- B. Instruction period shall be started after instruction books and service manuals have been submitted to and approved by the Architect and shall be at hours (regular and non-regular) arranged by the Architect.
- C. Service manuals shall include oiling, cleaning, and servicing data, compiled in clearly and easily understood form and in a durable binder. Data shall show all serial numbers of every piece of equipment and complete list of replacement parts.

3.14 WARRANTY

- A. The contractor shall warranty all the systems for proper operation installed by the contractor for not less than one calendar year from date of project completion. This completion date shall be set by the Architect or Owner.

END OF SECTION 230500

SECTION 230900 - HVAC CONTROLS**PART 1 - GENERAL****1.1 Description:**

- A. The intent of this document is to describe a system that is complete in every respect without further cost to the Owner. Anything not shown on the drawings or indicated in the specifications, and required for complete operating systems, shall be included as part of this Work. This will also include all connections to new services.
- B. All parts of the plans and specifications fully apply when applicable to work of this Division. No attempt has been made to divide the work between the various trades or subcontractors.

1.2 Control Contractor Qualifications:

- A. Controls contractor shall be a currently authorized Johnson Controls "Facility Explorer" **TC-PRO and ASI (Authorized Systems Integrator)** certified dealer at time of bid. Certifications shall be submitted with bid. No Exceptions. Contractor shall provide certificate from an ABCS authorized distributor, stating authorization of installing such systems in this geographic area. No Exceptions. Contractor shall have a minimum of three networked systems with proposed manufactures product already installed within a 75-mile radius of project site.
- B. The manufactures authorized Johnson Controls ABCS "Facility Explorer" distributor for this geographical territory shall approve all programming algorithms.
- C. Mechanical contractor shall assume full responsibility for accepting bids from contractors meeting this qualification.

1.3 Conduit and Wiring

- A. Control Contractor shall provide and install all low voltage conduit and wiring for DDC system as required for a complete and operating system. Conduit and wiring shall conform to Division 16 requirements.

1.4 Codes, Standards, Ordinances and Regulations:

- A. All work and materials shall be in full accordance with the latest rules and regulations of applicable codes as amended and adopted by any governmental agency which has jurisdiction over this work. Nothing in these Plans or Specifications is to be construed to permit work not conforming to these codes. Should the Plans or Specifications call for material, methods, or construction of a higher quality or standard than required by the above rules, the higher quality shall govern.
- B. When not contradicting the above, the manufacturers' recommendations along with applicable parts of the following documents shall be the basis for quality and technique of installation.
 - 1. Title 24, California Administrative Code, all parts.
 - 2. Applicable publications of the National Fire Protection Association (NFPA), and the National Electrical Code (NEC).

3. Applicable publications of the American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE).

1.5 Site Conditions and Locations:

- A. The general location and arrangement of system hardware is shown on the drawings. Information on the drawings relative to existing services is approximate only. Minor adjustments required to conform to actual locations shall be made without additional cost to Owner. The Contractor shall, as work progresses, verify the dimensions of the spaces available for the installation of the work and he shall assume full responsibility for the proper locations of each portion thereof.
- B. The construction documents are generally diagrammatic and the locations indicated may be approximate only. They do not show every offset, bend, or elbow required for installation in the space provided. The Contractor, therefore, shall install all equipment, conduit runs and the like as follows:
 1. Adhere to the location indicated as near as possible.
 2. Maintain ample head room and access in all passageways, clearance around all equipment and under conduit runs for unrestricted passage and for easy servicing of all apparatus, equipment, devices and the like.
 3. Provide access for maintenance of all equipment.

1.6 Submittals:

- A. Control Submittal: Within 30 calendar days after award of the contract, and before any materials of this Section are delivered to the job site, submit:
 1. Complete materials and equipment list with manufacturers' literature on all items proposed to be furnished and installed under this Section.
 2. Product data submittals must be complete and in a single bound document for all items supplied in this Division. Each document shall be bound with an index and marked with the equipment identification as specified in the Plans and Specifications.
 3. Provide complete control shop drawing including equipment, control devices, point to point connections with terminal numbers, and any details necessary for a complete control drawing.
 4. List of name plates to be engraved, showing each name plate wording and location.
- B. Record Documents:
 1. During progress of the work, maintain an accurate record of all changes made in the systems from those shown on the drawings, specifications and submittals.
 2. Revise Shop Drawings and provide on reproducible media and in DXF format compatible with MS DOS operating systems and Autocad R-14.
- C. Owner's Manual: Upon completion of the work, a complete bound book containing the following information shall be submitted to the Architect:
 1. Complete catalog and performance data on all control devices, including all documents included in submittals.

2. Complete manufacturers' operating and maintenance instructions on all control devices.
3. Complete wiring and control diagrams for all equipment and systems, including list of materials, description of operation and system flow diagrams.
4. Manufacturers' warranty certificates on all equipment.
5. Contractor's warrantee letter.

1.7 Operation:

- A. The Owner may require operation of parts or all of the installation for beneficial occupancy prior to final acceptance.

1.8 Guarantee:

The Contractor shall warrantee in writing all work performed under this contract for a period of one year from the date of notice of completion.

When notified of a system failure relating to the work performed under this contract, the contractor will be responsible for all investigation, diagnoses, repair, revision or replacement necessary to correct the condition.

PART 2 - PRODUCTS

2.1 General Product Description

- A. The Building Automation System (BAS) shall be capable of integrating multiple building functions, including equipment supervision and control, alarm management, energy management, and trend data collection. System shall be compatible with the existing Johnson Controls FX Web based front end and with Johnson Controls devices and controllers. BACnet, N2, Lon drivers shall reside in controller. OPEN NIC Statements – All Niagara 4 software licenses shall have the following NiCS: "accept.station.in=*"; "accept.station.out=*"; "accept.wb.in=*"; "accept.wb.out=*". Programming of the FX supervisory controller and creating all required dynamic graphics shall be included in this section.
- B. The BAS shall consist of the following:
 1. Local Display Devices.
 2. Portable Operator Terminals - Portable PC's – TCAX Touchscreens
 3. Distributed User Interfaces
 4. Network processing, data storage and communications equipment
 5. DC Controllers (HVAC etc)
 6. Other components required for a complete and working BAS.
- C. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, ASCs, and operator devices.

- D. System architectural design shall eliminate dependence upon any single device for alarm generation and control execution. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
- E. Basis of Design
 - 1. Facility Explorer by Johnson Controls

2.2 BAS Architecture:

A. Automation Network

- 1. The automation network shall be configured as a Client/Server network with a web server operating on the Clients LAN/WAN. The web browser interface is extended over the LAN/WAN. Monitoring and control of the BAS is available using the web browser interface.
- 2. The automation network shall include the option of a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard "off the shelf" products available through normal PC vendor channels.
- 3. The BAS shall network multiple user interface clients, system controllers and systems supervisors(s) as required for systems operation.
- 4. The automation network option shall be capable of operating at a communication speed of 10/100 Mbps.
- 5. The automation network option will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.

B. Control Network

- 1. The communication protocols utilized for peer-to-peer communications between NAC's will be Niagara 4 Fox, BACnet TCP/IP and SNMP and shall operate at a minimum communication speed of 9600 to 76,800baud. Use of a proprietary protocol for peer-to-peer communications between NAC's shall not be allowed.
- 2. Digital Controllers shall reside on the control network.

C. Integration

- 1. Hardwired
 - a. Analog and digital signal values shall be passed from one system to another via hardwired connections.
 - b. There will be one separate physical point on each system for each point to be integrated between the systems.
- 2. Direct Protocol (Integrator Panel)
 - a. The BAS system shall include appropriate hardware equipment and software to allow bi-directional data communications between the BAS system and 3rd party manufacturers' control panels. The BAS shall receive, react to, and return information from multiple building systems, including but not limited to the building HVAC systems and equipment specified on the project.

- b. All data required by the application shall be mapped into the BAS system, and shall be transparent to the operator.
- c. Point inputs and outputs from the controllers shall have real-time interoperability with BAS software features such as: Control Software, Energy Management, Custom Process Programming, Alarm Management, Historical Data and Trend Analysis, Totalization, and Local Area Network Communications.

2.3 User Interface

A. Browser Based Interface

1. The system shall be capable of supporting an unlimited number of clients using standard Web browser such as Internet Explorer™ or Netscape Navigator™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.
2. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the Building Automation System (BAS), shall not be acceptable.
3. The Web browser client shall support at a minimum, the following functions:
 - a. User log-on identification and password shall be required. If an unauthorized user attempts access, notice of access failure shall be displayed. Security using authentication and encryption techniques to prevent unauthorized access shall be implemented.
 - b. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
 - c. Storage of the graphical screens shall be in the Network Area Controller (NAC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
 - d. Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.
 - e. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
 1. Modify common application objects, such as schedules and setpoints in a graphical manner.
 2. Commands binary objects to start and stop.
 3. View logs and charts.
 4. View alarms.
 - f. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

4. Alarms

- a. Alarm feature shall allow user configuration of criteria to create, route, and manage alarms and events. It shall be possible for specific alarms from specific points to be routed to specific alarm recipients. The alarm management portion of the user interface shall, at the minimum, provide the following functions:
 - 1. Allow configuration to generate alarms on any numeric, binary, or data point in the system.
 - 2. Generate alarm records that contain a minimum of a timestamp, original state, acknowledged state, alarm class and priority.
 - 3. Allow the establishment of alarm classes that provide the routing of alarms with similar characteristics to common recipients.
 - 4. Allow a user, with the appropriate security level, to manage alarms - including sorting, acknowledging, and tagging alarms.
- 5. Reports and Summaries
 - a. Reports and Summaries shall be generated and directed to the user interface displays, with subsequent assignment to printers, or disk. As a minimum, the system shall provide the following reports:
 - 1. All points in the BAS
 - 2. All points in each BAS application
 - 3. All points in a specific controller
 - 4. All points in a user-defined group of points
 - 5. All points currently in alarm
 - 6. All BAS schedules
 - 7. All user defined and adjustable variables, schedules, interlocks and the like.
 - b. Reports shall be exportable to .pdf, .txt, or .csv formats.
 - c. The system shall allow for the creation of custom reports and queries.
- 6. Schedules
 - a. A graphical display for time-of-day scheduling and override scheduling of building operations shall be provided. At a minimum, the following functions shall be provided:
 - 1. Regular schedules
 - 2. Repeating schedules
 - 3. Exception schedules
 - b. Weekly schedules shall be provided for each group of equipment with a specific time use schedule.
 - c. It shall be possible to define one or more exception schedules for each schedule including references to calendars.
 - d. Monthly calendars shall be provided that allow for simplified scheduling of holidays and special days. Holidays and special days shall be user-selected with the pointing device or keyboard.

7. Password

- a. Multiple-level password access protection shall be provided to allow the user/manager to user interface control, display, and database manipulation capabilities deemed appropriate for each user, Based on an assigned password.
- b. Each user shall have the following: a user name, a password, and access levels.
- c. The system shall provide the capability to require a password of minimum length and require a combination of characters and numerical or special characters.
- d. When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.
- e. The system shall provide unlimited flexibility with access rights. A minimum of four levels of access shall be provided along with the ability to customize the system to provide additional levels.
- f. A minimum of 100 unique passwords shall be supported.
- g. Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.
- h. The system shall automatically generate a report of log-on/log-off and system activity for each user.
- i. All log data shall be available in .pdf, .txt, and .csv formats.

8. Dynamic Color Graphics

- a. The graphics application program shall be supplied as an integral part of the User Interface.
- b. The graphics applications shall include a create/edit function and a runtime function. The system architecture shall support an unlimited number of graphics documents (graphic definition files) to be generated and executed.
- c. The graphics shall be able to display real-time data that is acquired, derived, or entered.
- d. Graphics runtime functions –Each graphic application shall be capable of the following functions:
 1. All graphics shall be fully scalable.
 2. The graphics shall support a maintained aspect ratio.
 3. Multiple fonts shall be supported.
 4. Unique background shall be assignable on a per graphic basis.
- e. Operation from graphics – It shall be possible to change values (setpoints) and states in systems controlled equipment within the Web browser interface.
- f. Graphic editing tool – A graphic editing tool shall be provided that allows for the creation and editing of graphic files. The graphic editor shall be capable of performing/defining all runtime binding.

9. Historical Data Collection

- a. All numeric, binary or data points in the system database shall allow their values to be logged over time (trend log). Each historical record shall include the point's name, a time stamp including time zone, and the point's value.
 - b. The Network Area Controller (NAC) shall have the ability to store its historical data records locally and periodically to a remote server on the network (archiving).
 - c. The configuration of the historical data collection shall allow for recording data based on change of value or on a user-defined time interval.
 - d. The configuration of the historical data collection shall allow for the collection process to stop or rollover when capacity has been reached.
 - e. A historical data viewing utility shall be provided with access to all history records. This utility shall allow historical data to be viewed in a table or chart format.
 - f. The history data table view shall allow the user to hide/show columns and to filter data based on time and date. The history data table shall allow exporting to .txt, .csv, or .pdf file formats.
 - g. The historical data chart view shall allow different point histories to be displayed simultaneously, and also provide panning and zooming capabilities.
10. Audit Log
- a. For each log entry, provide the following data:
 1. Time and date.
 2. User ID
 3. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.
11. Database Backup and Storage
- a. The user shall have the ability to backup the System Controller databases.

2.4 Automation Network

A. Network Server

1. The district server is existing. Contractor shall have responsibility of bringing the firmware to current N4 revisions. Any sites that require this to match shall also be included in this contract.
2. Server Hardware Requirements: The server hardware platform shall have the following requirements:
 - a. Central Server: A dedicated server for BAS system with configuration that includes the following components as a minimum.
 - b. Processor: Xeon CPU E5-2640 (or better) compatible with dual and quad-core processors.
 - c. Memory: 8 GB for Windows 64 bit versions. Hard drive 6 GB.
 - d. Display: Video card and monitor capable of displaying 1024 x 768 pixel resolution or greater. Monitor shall be 28" or greater.
 - e. Connection to the FMCS network shall be via an Ethernet network interface card, 10/100 Mbps.

3. Local connections shall be via an Ethernet LAN. Remote connections can be via ISDN, ADSL, T1 or dial-up connection.
4. It shall be possible to provide access to all Network Area Controllers via a single connection to the server. In this configuration, each Network Area Controller can be accessed from the Graphical User Interface (GUI) or from a standard Web browser (WBI) by connecting to the server.
5. The server shall provide the following functions, at a minimum:
 - a. Global Data Access: The server shall provide complete access to distributed data defined anywhere in the system.
 - b. Distributed Control: The server shall provide the ability to execute global control strategies based on control and data objects in any NAC in the network, local or remote.
 - c. The server shall include a master clock service for its subsystems and provide time synchronization for all Network Area Controllers (NAC).
 - d. The server shall accept time synchronization messages from trusted precision Atomic Clock Internet sites and update its master clock based on this data.
 - e. The server shall provide scheduling for all Network Area Controllers and their underlying field control devices.
 - f. The server shall provide demand limiting that operates across all Network Area Controllers. The server must be capable of multiple demand programs for sites with multiple meters and or multiple sources of energy. Each demand program shall be capable of supporting separate demand shed lists for effective demand control.
 - g. The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of all commands issued to Network Area Controllers. Systems not employing this prioritization shall not be accepted.
 - h. Each Network Area Controller supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.
 - i. The server shall provide central alarm management for all Network Area Controllers supported by the server. Alarm management shall include:
 1. Routing of alarms to display, printer, email and email compatible pagers
 2. View and acknowledge of alarms
 3. Query alarm logs based on user-defined parameters
 - j. The server shall provide central management of log data for all Network Area Controllers supported by the server. Log data shall include process logs, runtime and event counter logs, audit logs and error logs.

B. Network Area Controller (NAC)

1. The NAC must provide the following hardware features as a minimum:
 - a. Communications
 1. Two 10/100 Mbps Ethernet Port – RJ-45 connection

2. Two Isolated RS-485 ports with biasing switches (up to 57,600 baud) shall be standard. Gateways or non-Johnson drivers not allowed.
 3. 1 GB RAM and 4 GB Flash Total Storage / 2 GB User Storage
 4. All required protocol drivers are included. Lon. BACnet, Modbus and N2 shall be resident as standard without additional costs, additional hardware External gateways shall not be acceptable.
 5. Embedded Wi-Fi in FX-80 shall be used. If FX-80 is mounted in a steel enclosure then antenna must be mounted outside of enclosure using the remote antenna kit.
- b. Remote Inputs/Outputs
 1. Four form C SPDT relay outputs rated for 24 VAC/DC @ 2Amps resistive each with individual LED indicators
 2. Six Universal Inputs for 10K NYC, 4-20 mA, 1-10 V, Dry contact
 3. Additional Remote I/O modules (four max) shall be allowed if needed
 - c. Environment
 1. Must be capable of operation over a temperature range of -20°C to 60°C.
 - d. Performance
 1. FX80 shall be licensed for however many controllers are on this project plus another 15%.
 2. SMA (Software Maintenance Agreement) shall be licensed for 5 years beginning at the time of contract being released.
2. The Network Area Controller (NAC) shall be a fully user-programmable device capable of providing all of the capability described in Section 2.3 Part A.
 3. Automation network – The Network Area Controller (NAC) shall reside on the automation network. Each NAC shall support one or more sub-networks of controllers.
 4. User Interface – Each Network Area Controller (NAC) shall have the ability to deliver a web based user interface as previously described. All computers connected physically or virtually to the automation network shall have access to the web based UI.
 5. Power Failure – In the event of the loss of normal power, The Network Area Controller (NAC) shall continue to operate for a define period after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software. Flash memory shall be incorporated for all critical controller configuration data.
 - a. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions.
 - b. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.
 - c. Certification – All controllers shall be listed by Underwriters Laboratories (UL).
- C. Application Specific Controllers (ACS's)

1. The ASC devices must provide the following hardware features as a minimum:
 - a. Communications:
 1. BACnet PCG/PCV/TEC3000 controllers by Johnson Controls shall be installed.
 - b. Inputs/Outputs
 1. Six form C SPDT relay outputs rated for 24 VAC/DC @ 2Amps resistive each and three 0-10vdc analog outputs shall be available.
 2. Six Universal Inputs for 1K Ω , 4-20 mA, or 0-10 V, Dry contact
 - c. Environment
 1. Must be capable of operation over a temperature range of 0°C to 55°C.
 2. Must be capable of withstanding storage temperatures of between 0°C and 70°C.
 3. Must be capable of operation over a humidity range of 5% to 95% RH, non-condensing.

2.5 Software Programming/Tools

A. Network Area Controller Toolset

1. Device embedded toolset shall provide the following capabilities in a graphical environment using a standard Web browser:
 - a. Device and point management
 - b. Scheduling, alarming and trending setup
 - c. Creation and binding of graphics
 - d. Time management
 - e. User management
2. Toolset provides additional engineering capabilities including:
 - a. Editable table based point listings.
 - b. Automatically generated graphics for standard applications.

B. Device Program Editor

1. Definition of application and logic and display operation shall be available in a completely graphic environment.
2. Definition of operator device characteristics, Digital Controllers (DC) panels, individual points, applications, and control sequences shall be performed in a drag and drop programming environment.
3. All temperature and equipment control strategies, energy management routines, scheduled operations and local device status indicators shall be definable by the operator. User password access and language options shall be definable by the operator.
4. Event definition, prioritization, logging and reporting options are definable by the operator.

5. Application logic shall provide for stand-alone applications as well as distributed applications that are automatically downloaded from master controllers to a network of controllers.
6. The programming environment shall provide help menus and instructions for each operation and/or application performed, for all programming library functions, and for the programming language itself.
7. Libraries of standard application modules shall be provided, such as temperature, humidity, and flow control. These modules may be used as “building blocks” in defining or creating new control sequences. In addition, the user shall have the capability to easily create and archive new modules and control sequences.

2.6 Local Control Panels

- A. All control panels shall be factory constructed, incorporating the BAS manufacturer's standard designs and layouts. All control components shall be UL inspected and listed. Control panels shall be fully enclosed, with sub-panel, hinged door, and slotted flush latch. Control panels shall exist on all equipment specified and shall be UL listed as a complete fabricated system. UL listings shall be shown on final drawings.
- B. In general, the control panels shall consist of the DDC controller(s), display module as specified and indicated on the plans, and I/O devices—such as relays, transducers, and so forth—that are not required to be located external to the control panel due to function. Where specified the display module shall be flush mounted in the panel face unless otherwise noted.
- C. All I/O connections on the DDC controller shall be provide via removable or fixed screw terminals.
- D. Low and line voltage wiring shall be segregated. All provided terminal strips and wiring shall be UL listed, 300-volt service and provide adequate clearance for field wiring.
- E. All wiring shall be neatly installed in plastic trays or tie-wrapped.
- F. A convenience 120 VAC duplex receptacle shall be provided in each enclosure, fused on/off power switch, and required transformers.

PART 3 - EXECUTION

3.1 Preparations:

- A. Prior to Installation: Inspect the installed work executed under other Sections which affect the installation of the controls. Report unacceptable conditions to Engineer. Do not begin work until unacceptable conditions have been corrected. Installation of the controls shall constitute acceptance of existing conditions.
- B. Coordination: Coordinate work with work specified under other Sections to ensure proper and adequate interface of work. Equipment and systems drawings are generally diagrammatic unless dimensions are indicated. Drawings and details shall be checked for interference's with structural and other conditions prior to performing work.
- C. The Contractor shall be responsible for safety and good condition of his materials and equipment until final acceptance by the Owner. He shall erect and maintain suitable barriers, protective devices, lights and warning signs where required.

3.2 Installation:

A. General:

1. When applicable installation procedures are shown or specified in other sections, those procedures shall be followed.
2. Provide all supports and hangers, etc., as required to install the equipment as specified or shown on the drawings. All equipment shall be supported, braced and cross-braced to comply with current CBC and CMC.
3. Sealing: Wherever any part of the control system has to pierce the roofing, openings through the roof shall be flashed absolutely watertight.
4. Arrange and support piping and equipment so that vibration is at a minimum and is not transmitted to or through building structure.

3.3 Wiring and Conduit:

A. Control wiring and conduit shall be the responsibility of this section and be installed as follows:

1. In equipment rooms/attics – Conductors shall be run in conduit. Final connection to equipment shall be flexible conduit.
2. Concealed in building construction (wall/inaccessible ceilings) - Conductors shall be run in conduit.
3. Roof mounted/exterior equipment yards - Conductors shall be in conduit. All flexible conduit shall be seal-tite with weatherproof connections. Equipment on grade and detached from the building a distance greater than 36" shall have underground control conduit routed to equipment.
4. Above accessible ceiling spaces - Control cable will be allowed to be installed without conduit in accessible areas above ceilings as follows:
 - a. Cable is an approved type for the application.
 - b. Cable is bundled/organized in management devices routed square with building lines (no diagonals) and kept clear of electrical devices (i.e., ballasts, transformers, etc.) that could cause interference.
 - c. Conduit sleeves are provided between accessible ceiling spaces (i.e., across soffits, gypboard ceilings, etc.) as required to maintain future access to cable.
5. Cable routed in accessible ceiling spaces shall comply with EIA/TIA standards for communications cabling. Communication bus wire shall be W223C-2144FCBC Connect Air, blue jacketed shielded cable.

3.4 Control Panels and Device Locations:

- #### A.
- All controllers, relays, switches, etc., for equipment located within equipment rooms shall be mounted in enclosed UL listed control panels with hinged locking doors. All control devices equipment located

in exposed areas subject to outside weather conditions shall be mounted inside weatherproof enclosures.

- B. Location of each panel is to be convenient for adjustment and service. Submit locations of all panels to the engineer with shop drawings.

3.5 Identification:

- A. The label wording shall match that used on the drawings and provide clearly readable printed labels for each control component inside a panel. When applicable, additional identification needed shall be documented on the Shop Drawings. See Specification Section 15100.
- B. Engraved nameplates shall be provided on the face of each panel and beneath each actuator and control device not in a panel describing its use.
- C. All electrical devices within the panel shall be wired to a terminal strip within the panel. An "electric terminal" numbering system shall be applied to all terminals with aforementioned numbers matching terminals shown on Shop Drawings.

3.6 Closing-in of Uninspected Work:

- A. General: Do not allow or cause any of the Work of this Section to be covered up or enclosed until it has been inspected, tested, and approved by the Mechanical Engineer and by all other authorities having jurisdiction.
- B. Uncovering: Should any of the Work of this Section be covered up or enclosed before it has been completely inspected, tested, or approved, do all things necessary to uncover all such work. After the Work has been completely inspected, tested, and approved, provide all materials and labor necessary and make all repairs necessary to restore the Work to its original and proper condition at no additional cost to the Owner.

3.7 Programming:

- A. The Direct Digital Control (DDC) operational program will be provided by the TC-PRO Contractor. The Contractor shall provide any testing program he feels necessary to fully test the operation of the various components. Programming shall be verified for proper operation by Total Control.

3.8 System Instruction and Record Drawings

- A. The Control Contractor shall schedule a minimum of 24 hours of training to train the owner's representative in the use and care of the system. This training shall occur after all commissioning of the control system is completed.
- B. Instruction period shall be started after instruction books, service manuals and record drawings have been submitted to and approved by the Architect and shall be at hours (regular and non-regular) arranged by the Architect.

- C. Service manuals shall include oiling, cleaning and servicing data, compiled in clearly and easily understood form and in a durable binder. Data shall show all serial numbers of every piece of equipment and complete list of replacement parts.

3.9 Commissioning of the HVAC Control System:

- A. The commissioning scope of work covered in this section is to be performed by the installing controls contractor.
- B. The commissioning period starts when the following conditions are met:
 - 1. The DDC system and all involved HVAC equipment have been installed, connected to the DDC system and ready to operate.
 - 2. A commissioning meeting has been conducted with representative of contractors involved building occupants, General Contractor, Mechanical Contractor, Total Control and the TC-PRO System Contractor.
 - 3. Consensus is reached, by the representatives at the above referenced meeting, that it is appropriate for the commissioning process to start. The operational program is loaded into the DDC system by the TC-PRO Contractor.
- C. During the commissioning period, the TC-PRO Contractor will maintain a commissioning file of the printed reports from the building.
- D. During the commissioning period all mechanical equipment with filters shall have new filters installed. The static pressure across the fan shall be accurately measured and documented if installed.
- E. The commissioning process will be completed and the warranty period shall start when the following conditions are met.
 - 1. All training to be provided as part of the project has been completed.
 - 2. No "alarm" or "condition reports" are being generated by the DDC system for seven (7) calendar days (168 hours) due to incomplete or inaccurate installation, program, or programming.
 - 3. All adjustments and "fine tuning" of the system have been completed.
 - 4. The system has been accepted by the General Contractor and Building Owners and approved by the Mechanical Engineer.

END OF SECTION 230900

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SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:

1. Materials and equipment shall be furnished and installed in support of electrical work described in these plans and specifications including but not limited to, raceways, boxes, enclosures, feeders, branch circuiting, supports, terminal cabinets, sleeves, gutters, panels, lighting fixtures, controls, relays, contactors, in order to complete and make fully functional the systems described.
2. Complete fire alarm and annunciation system as shown and/or as required by the Division of State Architect (DSA) including monitoring equipment and wiring for central station connection.
3. Lighting systems, both interior and exterior as shown on the plans and as specified herein, including controls, occupancy sensors, photocell controls, lamps, dimmers, drivers, supports, fasteners, straps, and miscellaneous mounting hardware and support structures for such equipment.
4. Duct banks and raceways for all power and communications systems as shown and/or required. Duct banks shall include all trenching, racking, conduit, concrete, backfill, boxes, pads, substructures required for a fully developed and useable pathway for cables, conductors, as shown on site, etc.
5. HVAC and plumbing electrical: Conduit, conductors and terminations for all line voltage power, line voltage controls and fusible and/or non-fusible safety disconnect switches for HVAC equipment, including but not limited to air conditioners, furnaces, fans, heat pumps, cooling towers, system pumps, condensing units. Provide protective equipment unless otherwise noted, etc. including protective devices.
6. Plumbing Electrical: Conduit, conductors and terminations for plumbing equipment with power requirements including necessary fusible and/or non-fusible safety disconnect devices. Provide motor starters where required unless provided by mechanical specification.
7. Power and Lighting Distribution: Furnish and install power and lighting distribution systems including but not limited to panels, feeders, branch circuits, devices, fixtures, disconnect switches, contactors, controls, etc. for a complete working system.
8. Selective Electrical Demolition as shown on construction documents and as required to satisfy intent of construction documents including field verification of existing systems and conditions.

9. Data systems infrastructure including all work outlets, poe clocks, speakers, boxes, raceways, dedicated branch circuits, sleeves and penetrations, etc. as described and as shown in plans, risers, specifications, EIA/TIA standards and/or required for a complete and operating system.
10. Lighting acceptance testing, documentation and completion of required forms as specified in Section 265670, LIGHTING ACCEPTANCE TESTING.
11. Allocation of time to adequately train the Owner on the use and operation of all systems installed within the facility or on the property. Minimum two week advance notice shall be coordinated with the Owner and his representatives. Training shall be as outlined in individual system specifications identified to follow.

B. Related Sections Under Other Divisions:

1. Mechanical Wiring: Control circuit wiring, energy management controls and interlocks for mechanical equipment shall be installed by Mechanical Contractor.
2. Painting of electrical equipment where exposed and required by the Architect to be painted as described elsewhere in the specification.
3. HVAC Control Raceway: Raceways, boxes, and control wiring for thermostats, temperature sensors and control components specified within the mechanical specifications, shall be furnished and installed as required by Division 25 and installed in accordance with the minimum wiring methods allowed for branch circuit wiring in Division 26 (the DDC systems/EMS systems and components are installed in accordance with Division 25).
4. Smoke Fire Dampers: Coordination with Mechanical plans for exact locations and points of connection for power and fire alarm system connections (power and fire alarm connection shall be by Electrical Contractor).
5. Duct mounted smoke detectors: Coordination with Mechanical plans for exact locations and points of connection for power and fire alarm system connections (power and fire alarm connection shall be by Electrical Contractor).
6. Security System: Shall be installed by Owner's vendor. Contractor shall provide conduits, boxes, stubs to accessible ceilings, dedicated circuit(s) for alarm panel, access control system (key pads, electric locks), etc. as shown and/or required by the Owner's vendor.

1.3 SYSTEM DESCRIPTION

- A. The electrical plans indicate the general layout and arrangement; the architectural drawings and field conditions shall determine exact locations.
- B. Field verify all existing conditions and modify as required to satisfy design requirements as well as code minimums. Maintain all required working clearances as described in CEC Article 110 as well as other applicable articles.
- C. Discrepancies shall be brought immediately to the attention of the Architect for clarification. The Architect shall approve any changes. Prior to rough-in, refer to architectural plans that shall take precedence over electrical plans with respect to locations.

1.4 SUBMITTALS AND SHOP DRAWINGS

- A. Before construction, submit in (accordance with the General Conditions of this Specification) a complete list of all materials proposed to be furnished and installed under this section. Any material procured without review and approval of the engineer and/or owner's representative, will solely be at the contractor's risk.
- B. Manufacturers' specifications, catalog cuts and shop drawings as required to demonstrate compliance with the specifications. Identify specific intended use for each component where submittal may be ambiguous. Provide entire bound submittal for all equipment at one time; partial submittals will not be accepted. At a minimum, submittals will be required for the following:
1. Site work equipment including ducts, conduits, fittings, concrete pull boxes, vaults, accessories, etc.
 2. Distribution equipment including branch circuit panels, grounding, etc.
 3. Electrical equipment including disconnects, fuses, raceways, straps and racks, fittings, conductors, boxes, gutters, devices, plates, etc.
 4. Lighting equipment including fixtures, drivers, lamps, mounting accessories, color charts (where required), etc.
 5. Lighting control equipment including line and low voltage switching systems, occupancy sensing equipment, lighting control panels, time clocks, photocells, lumen sensors, etc.
 6. Constructability review letter/comments for lighting acceptance testing as required by Section 265670, LIGHTING ACCEPTANCE TESTING.
 7. Complete system component submittals and shop drawings for:
 - a. Voice Public Address System
 - b. Intercom
 - c. Master Clock System
 - d. Sound Systems with assisted listening devices as required to meet CBC, Chapter 11B.
 - e. Fire Alarm System
 - f. Communication Systems including but not limited to; cable, fiber, terminations, cable management, cable tray, patch panels, equipment racks, specified active electronics (where specified), cabinets, jacks, plates, cable labeling, testing procedure.
 8. Conduit including all fittings, etc.
 9. Wiring and cable, terminations, etc.
 10. Fire rating penetration materials, details, etc.
- C. The intent of these specifications is to establish a standard of quality for materials and equipment. Therefore, some items are identified by manufacturer or trade name designation. Substitutions shall be subject to the Architect's approval. Samples of the proposed and substitute materials may be required for inspection prior to approval. Costs, if any, for evaluation of substitutions shall be the Contractor's responsibility. The decision of the Architect shall be final. Where the substitution will affect other trades, coordinate all changes with those trades concerned and pay any additional costs incurred by them as a result of this substitution. Approval of substitutions shall not relieve the Contractor from providing an operational system in accordance with all applicable codes and ordinances.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Storage of equipment for the job is the responsibility of the Electrical Contractor and shall be scheduled for delivery to the site, as the equipment is required. Damage to the equipment delivered to the site or in transport to the job shall be the responsibility of the Electrical Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials shall be new and bear the label of or be listed by a nationally recognized testing laboratory. The quality and suitability of all materials shall conform to the standards and practices of this trade.
- B. Supplied materials shall be of a current manufactured product line. Discontinued products are not acceptable. Where products are identified on the contract documents by part number, supply the current product model or series which meets the specification and intended use of the specified component.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Professionalism and appearance of installations shall be in accordance with accepted practices of this trade. Installation methods shall conform to manufacturers' specifications and recommendations. The Contractor shall man the job with qualified journeymen and helpers in this trade for the duration of the job. It is the Contractor's responsibility to communicate with and keep the job superintendent apprised of changes or clarifications, etc.
- B. Employment of any person on any job in the capacity of an electrician is not permitted unless such person has qualified for and holds a valid Journeyman Electrician Pocket Card or General Journeyman Electrician Certificate issued by the State of California Division of Apprenticeship Standards except, Contractor may employ electrical helpers or apprentices on any job of electrical construction, new or existing, when the work of such helpers or apprentices is performed under the direct and constant personal supervision of a journeyman electrician holding a valid Pocket Card accepted by the State of California Division of Apprenticeship Standards.
 - 1. Each Pocket Card carrying journeyman electrician will be permitted to be responsible for the quality of workmanship for a maximum of one helper or apprentice during any same time period, provided the nature of work is such that good supervision can be maintained and the quality of workmanship is the best, as expected by Owner and implied by the latest edition of the National Electrical Code.

2. Before each journeyman electrician commences work, deliver to Owner at the project site, a photocopy of the journeyman's valid Pocket Card.
- C. Materials shall be installed in accordance with the manufacturers' specification and recommendations. They must conform to the approval AHJ adopted codes and standards, but not less than the 2022 CEC and all applicable codes and standards, including but not necessarily limited to California Code of Regulations Title 24, NFPA, National Electrical Manufacturers Association, ANSI, CBC, and any other adopted ordinances of applicable agencies having jurisdiction. Refer to general conditions of specifications.
- D. Electrical Contractor shall lay work out in advance in order to avoid unnecessary cutting, chasing, and drilling of floors, walls, ceilings and other surfaces. Work of this nature shall be carefully done so as not to damage work already performed by other trades. Any damage which results must be properly repaired at no extra cost to the Owner. Such alterations shall not depreciate the integrity of the structure. Approval for cuts or penetrations in structural members shall be by the Architect.
- E. Supporting Devices:
1. Verify mounting height of all luminaires or items prior to installation when heights are not detailed.
 2. Install vertical support members for equipment and luminaires, straight and parallel to building walls. Provide independent supports to structural member for electrical luminaires, materials, conduit supports, or equipment installed in or on ceiling, walls or in void spaces or over furred or suspended ceilings.
 3. Do not use other trade's fastening devices as supporting means for electrical equipment, materials or luminaires. Do not use supports or fastening devices to support other than one particular item.
 4. Support conduits within 18" of outlets, boxes, panels, cabinets and deflections. Maximum distance between supports not to exceed 8' spacing.
 5. Securely suspend all junction boxes, pull boxes or other conduit terminating housings located above suspended ceiling from the floor above or roof structure to prevent sagging and swaying.
 6. Provide seismic bracing per UBC requirements for this building location.
 7. Supporting Devices: Safety factor of 4 required for every fastening device or support for electrical equipment installed. Support to withstand four times weight of equipment it supports. Bracing to comply with seismic design category as per Structural Engineer.
- F. Coordinate work with other trades as required to eliminate any delays during construction. Coordinate changes with other prime contractors to avoid construction conflicts. Contractor to review architectural, mechanical, plumbing and fire protection drawings and specifications included as part of project, confirm all required electrical interlocking, data distribution and fire alarm connections and include as part of contractors bid. No allowance shall be made by contractor due to lack of performing coordination work noted.
- G. Engineer's Field Observation: Site visits during construction for field observations and reports will be conducted by electrical engineer when directed by the Architect. A list of items that need to be

addressed will be submitted to the Architect for forwarding to the Contractor. A written response to all items shall be submitted for Owner's review once complete. When Electrical Engineering representative performs a field observation, the Electrical Contractor shall be present and available to remove equipment covers as needed.

- H. Drawings of Record: Provide a full and accurate set of field record drawings marked up in a neat and understandable manner submitted to the Owner Representative, Construction Manager, or Architect upon completion of the work and prior to issuance of a certificate of completion. The drawings shall dimension all electrical facilities including but not limited to underground conduit, vaults, boxes as well as conduit routing scaled to within 12" of actual field conditions and shall be kept up to date on a daily basis reflecting changes or deviations. Electrical facilities shall be accurately drawn on the plan to scale. Refer to the general conditions of these specifications for additional requirements. Record drawings shall be required to identify both horizontal and vertical dimensions to visible and fixed points such as concrete, asphalt, buildings, sidewalks, etc.
- I. Identification: Provide engraved laminated plastic nameplates for all switchboards, panelboards, fire alarm terminal cabinets, telephone and cable television backboards, main devices, control panels, time clocks, contactors and safety disconnect switches accurately identifying each device. Labels shall be attached to the equipment by means of screws or rivets. Self-adhering labels will not be acceptable.
- J. Safety: The Electrical Contractor is responsible to maintain equipment in a safe and responsible manner. Keep dead front equipment in place while equipment is energized. Conduct construction operations in a safe manner for employees as well as other work persons or anyone visiting the job site. Provide barriers, trench plates, flags, tape, etc. The Contractor shall hold all parties harmless of negligent safety practices that may cause injury to others on or near the job site.
- K. Guarantees: Equipment and labor shall be guaranteed and warranted free of defects, unless otherwise stated to be more restrictive, for a period of one year from the date of final acceptance by the Owner. A written warranty shall be presented to the Architect at the time of completion prior to final acceptance. Equipment deemed to be damaged, broken or failed should be repaired or replaced at no additional cost to the Owner. Materials or system requiring longer than a one-year warranty as described herein shall be separately warranted in separate letters of guarantee stating the duration of warranty.
- L. Operating and Installation Manuals: Provide two copies each of manuals, operating and installation instructions for equipment indicated in submittal packages. Instruct the Owner's representative as to the operation and location of equipment necessary to allow them to operate the facility upon final acceptance. This instruction period shall be prearranged with the Owner's representative prior to occupancy of the facility and the weeks prior to training scheduled.

- M. Lighting Acceptance Testing: Provide two copies of lighting acceptance testing results and equipment operating manuals as specified in Section 265670, LIGHTING ACCEPTANCE TESTING. Instruct the Owner on operation of control systems.

END OF SECTION 260500

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SECTION 260501 – SELECTIVE ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Electrical demolition.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work shall be as specified in individual sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor to walk job to observe existing conditions and account for variances discovered from drawings as needed.
- B. Verify field measurements and circuiting arrangements as shown on drawings.
- C. Verify that abandoned wiring and equipment serve only abandoned facilities, completely remove all abandoned wiring and cabling for systems no longer in use.
- D. Demolition Drawings are based on limited field observation and existing record documents. Field verify and report any discrepancies to Owner/Architect before disturbing existing installation.

3.2 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

- B. Coordinate system service outages directly with owner.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, observe provisions of NFPA 70E and CALOSHA, use personnel experienced in such operations.
- D. Existing Electrical Service: Disable system only to perform work as shown on drawings. Obtain permission from Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area as required (where applicable).
- E. Existing Fire Alarm System: Coordinate outages with Owner and local fire department. Notify Owner/Owner's representative at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area. It is the contractors responsibility as a means and methods process to disable and systematically remove the existing campus wide fire alarm system and devices in order to complete the work as described and meet the project schedule.
- F. Existing Communications System: Disable system only to perform work as shown on drawings. Notify Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Demolish and extend existing electrical work under provisions of this section.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Allow the owner first right to retain ownership of all salvaged materials, otherwise the Electrical Contractor is responsible for its removal from the site and proper disposal or recycling.
- D. Remove abandoned wiring to source of supply.
- E. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- F. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
- G. Disconnect and remove abandoned panelboards and distribution equipment.
- H. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

- I. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- J. Discarded electrical components and lamps containing hazardous waste (i.e., mercury in fluorescent lamps) shall be disposed of as required by the State Laws and Local Ordinances regarding hazardous materials.
- K. Repair adjacent construction and finishes in kind damaged during demolition and extension of work.
- L. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
- M. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.4 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment which remain or are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide blank plates for all vacant circuit breaker positions. Provide typed circuit directory showing revised circuiting arrangement.
- C. Luminaires: Cleaning light fixtures. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry.

3.5 INSTALLATION

- A. Install relocated materials and equipment as shown and/or as required.

END OF SECTION 260501

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SECTION 260519 – LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Wires and cables.
 - 2. Connectors.
 - 3. Lugs and pads.

1.3 SYSTEM DESCRIPTION

- A. Provide wires, cables, connectors, lugs, strain reliefs, racking for a complete and operational electrical systems.

1.4 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Provide product data for the following equipment:
 - 1. Wires.
 - 2. Cables.
 - 3. Connectors.
 - 4. Lugs.
 - 5. Splice Kits.
- C. Provide the insulation cable testing report in the project closeout documentation, refer to Closeout Requirements in the General Conditions portion of this specification.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of the CEC, latest adopted version with amendments by local Authority Having Jurisdiction (AHJ).
- B. Furnish products listed by UL or other testing firm acceptable to AHJ.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Wires and Cables: General Cable, Okonite, Southwire, or approved equal.
- B. Connectors: Burndy, IlSCO, Thomas & Betts, or approved equal.
- C. Wire connectors shall be minimum 75 degree centigrade rated and properly sized for the number of conductors being connected, terminated, spliced etc. All above grade connectors shall be solderless lug or plastic wire nut type, screw on, pressure cable type (wire nut or spring nut type), 600 volt, 105 degree C, with skirt to cover all portions of stripped wires. Connector shall be U.L. rated for number and size of conductors being joined together as a splice.
- D. Splices:
 - 1. Branch Circuit Splices: Ideal, Scotch-Lock, 3M, or approved.
 - 2. Feeder Splices: Compression barrel splice with two layers Scotch 23 and four layers of Scotch 33+ as vapor barrier.
 - 3. Screw Terminal Lugs.
 - 4. Kearney Split Bolt.

2.2 WIRES AND CABLES FOR LINE VOLTAGE SYSTEM AND CONTROLS. WIRE AND CABLE SHALL BE:

- A. Copper, 600 volt rated throughout. Conductors 12AWG to 10AWG, solid or stranded. Conductors 8AWG and larger, stranded.
- B. Phase color to be consistent at all feeder terminations; A-B-C, top to bottom, left to right, front to back. Phasing tape shall be permitted on sizes #6 and larger.
- C. Color Code Conductors as Follows:

PHASE	208 VOLT	240 VOLT DELTA
A	Black	Black
B.	Red	Orange (High Leg)
C.	Blue	Blue
Neutral	White	White
Ground	Green	Green
- D. All conductors shall be copper unless otherwise noted. Minimum size for individual conductors shall be #12 AWG unless otherwise noted. Sizes #8 AWG and larger shall be stranded conductor. Individual conductors shall be insulated with type, XHHW, THW, THHN/THWN 600-volt insulation unless otherwise noted. Control, signal, communication conductors shall be as dictated by the vendor of that equipment or as specified here-in. Proper insulation type shall be used for the proper environmental application (i.e., waterproof, wet location, plenum, temperature

rated). If a condition exists where the application is uncertain, contact the Engineer for direction. Contractor is responsible to follow specific cabling requirements described in other sections of this specification relative to various communications and controls systems as well as the respective riser diagrams shown on plans. If a discrepancy occurs, communicate such discrepancy to the Architect and Engineer immediately for resolution.

- E. Insulation types THWN, THHN or XHHW. Minimum insulation rating of 90C for branch circuits.
- F. Refer to signal and communications specification sections for cable requirements.

2.3 CONNECTORS

- A. Copper Pads: Drilled and tapped for multiple conductor terminals.
- B. Lugs: Indent/compression type for use with stranded branch circuit or control conductors.
- C. Solid Conductor Branch Circuits: Spring connectors, wire nuts, for conductors 12 through 8AWG.

2.4 LUGS AND PADS

- A. Ampacity: Cross-sectional area of pad for multiple conductor terminations to match ampere rating of panelboard bus or equipment line terminals.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation: Conductors shall not be installed until after conduit systems are permanently in place. Use an approved non hardening type wire pulling lubricant if lubricant is to be used. Maintain all conduits and wire pulls free from foreign material. If due to field conditions, more than a total of 300 degrees of bend are required; a pull box shall be furnished and installed for ease of installation. Said pull boxes must be sized and rated for the appropriate application and must remain easily accessible upon completion of the project (approval of the location shall be obtained from the Architect prior to installation). Show these pullboxes on the field record drawings. Conductors installed in underground raceways on site shall be duct sealed and taped where they exit the raceway to prevent the entrance of foreign material and moisture after the conductors are installed. Proper drainage shall be provided for underground pull and splice boxes.
- B. Insulation: Use proper insulation types where temperature and environment are a factor.
- C. Splices at or below grade level are not allowed.

- D. Labeling: All conductors in panels, switchboards, terminal cabinets, vaults, pull boxes, and junction boxes shall be labeled with tape number markers indicating circuit number and identifying system. All labeling shall be permanent. In manholes and vaults, provide embossed brass tags identifying system serviced and function.
- E. All conductors, wiring, cable where installed below floor, slab or underground shall be considered wet locations, and shall be rated accordingly. Non waterproof cabling is not allowed in any below grade or wet application.
- F. Cables routed together in cable tray shall be stacked, organized and tie wrapped together in a neat and workman like manner. Random cable routing is not acceptable.
- G. Cable and conductors routed through pull boxes and vaults shall be properly supported on porcelain or equal insulators mounted on steel rack inserts. Bend radius of cable or conductor shall not be less than six times the overall cable diameter.
- H. Wires and Cables:
 - 1. Conductor Installation:
 - a. Install conductors in raceways having adequate, code size cross-sectional area for wires indicated.
 - b. Install conductors with care to avoid damage to insulation.
 - c. Do not apply greater tension on conductors than recommended by manufacturer during installation.
 - d. Use of pulling compounds is permitted. Clean residue from exposed conductors and raceway entrances after conductor installation.
 - 2. Conductor Size and Quantity:
 - a. Install no conductors smaller than 12AWG unless otherwise shown.
 - b. Provide all required conductors for a fully operable system.
 - 3. Provide dedicated neutrals (one neutral conductor for each phase conductor).
 - 4. Conductors in Cabinets:
 - a. Cable and train all wires in panels and cabinets for power and control neatly and uniformly. Use plastic ties in panels and cabinets.
 - b. Tie and bundle feeder conductors in wireways of panelboards.
 - c. Hold conductors away from sharp metal edges.
 - d. Connectors: Retighten mechanical type lugs and connectors for conductors to equipment prior to Notice of Completion.

3.2 FIELD QUALITY CONTROL

- A. Tests:
 - 1. Test conductor insulation on feeders of 400 amp and greater for conformity with 1000 volt megohmmeter. Use Insulated Cable Engineers Association testing procedures. Minimum insulation resistance acceptable is 1 megohm for systems 600 volts and below.

2. Test Report: Prepare a typed tabular report indicating the testing instrument, the feeder tested, amperage rating of the feeder, insulation type, voltage, the approximate length of the feeder, conduit type, and the measured resistance of the megohmmeter test. Submit report with operating and maintenance manual.

END OF SECTION 260519

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SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Grounding and bonding requirements of electrical installations for personnel safety and to provide a low impedance path for possible ground fault currents as described in CEC Article 250.
 - 2. "Grounding electrode system" refers to all electrodes required by CEC, as well as including made, supplementary, lightning protection system and telecommunications system grounding electrodes.
 - 3. The terms "connect" and "bond" are used interchangeably in this specification and have the same meaning.
- B. Related Work:
 - 1. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
 - 2. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

- A. Equipment grounding conductors shall be UL 83 insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG and larger shall be permitted to be identified per CEC.
- B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes No. 10 AWG and smaller shall be ASTM B1 solid bare copper wire.

- C. Conductor sizes shall not be less than what is shown on the drawings and not less than required by the CEC, whichever is greater.

2.2 SPLICES AND TERMINATION COMPONENTS

- A. Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).

PART 3 - EXECUTION

3.1 GENERAL

- A. Ground in accordance with the CEC, as shown on drawings, and as hereinafter specified.

3.2 INACCESSIBLE GROUNDING CONNECTIONS

- A. Make grounding connections which are buried or otherwise normally inaccessible (except connections for which periodic testing access is required) by exothermic weld.

3.3 SECONDARY EQUIPMENT AND CIRCUITS

- A. Service Disconnect: Provide a ground bar bolted to the enclosure with lugs for connecting the various grounding conductors.
- B. Conduit Systems:
 - 1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor sized per CEC.
 - 2. Non metallic conduit systems shall contain an equipment grounding conductor.
 - 3. Metal conduit containing only a grounding conductor, and which is provided for mechanical protection of the conductor, shall be bonded to that conductor at the entrance and exit from the conduit.
- C. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders, power and lighting branch circuits.
- D. Boxes, Cabinets, Enclosures, and Panelboards:
 - 1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes.
 - 2. Provide lugs in each box and enclosure for equipment grounding conductor termination.
 - 3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.

- E. Motors and Starters: Provide lugs in motor terminal box and starter housing or motor control center compartment to terminate equipment grounding conductors.
- F. Receptacles shall not be grounded through their mounting screws. Ground with a jumper from the receptacle green ground terminal to the device box ground screw and the branch circuit equipment grounding conductor.
- G. Ground lighting fixtures to the equipment grounding conductor of the wiring system when the green ground is provided; otherwise, ground the fixtures through the conduit systems. Fixtures connected with flexible conduit shall have a green ground wire included with the power wires from the fixture through the flexible conduit to the first outlet box.
- H. Fixed electrical appliances and equipment shall be provided with a ground lug for termination of the equipment grounding conductor.

3.4 TELECOMMUNICATIONS SYSTEM

- A. Bond telecommunications system grounding equipment to the electrical grounding electrode system. Refer to Section 271300, INTERCOMMUNICATIONS SYSTEMS.

END OF SECTION 260526

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SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL 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. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.
- B. Related Sections include the following:
 - 1. Section 260548 "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.

1.4 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.5 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.6 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Equipment supports.

1.7 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.8 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.9 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations as per architectural specifications.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 4. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- E. 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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 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 in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 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 NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. 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.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- 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 shall be weight of supported components plus 200 lb (90 kg).

- 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 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
 6. To Steel: Beam clamps (MSS 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 meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid 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 electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

- A. Touchup: 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.
1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

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SECTION 260533 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Conduit and fittings.
2. Outlet boxes.
3. Weatherproof outlet boxes.
4. Junction and pull boxes.
5. Floor boxes and poke-through.
6. Cabinets, termination cabinets.
7. Gutters.
8. Concrete boxes and vaults.

B. Related Work:

1. Installation of all wire, cable, conductor, boxes/gutters, pull ropes, fiber optic cable raceway, conduit, innerduct, cable sleeve and duct as described on the plans and/or as specified here-in. This scope shall include pathways to be installed underground on site and offsite, underslab, above grade, both concealed and exposed, overhead concealed and exposed as appropriately applied. Raceways/boxes shall be installed in accordance with their intended and allowed uses and as specified here-in whichever is more restrictive. Size and capacity of all raceway/boxes shall be as specified here-in or as depicted on the drawings, but shall not be less than that required by code. Larger raceway sizes may be specified than code would permit. The specifications shall govern.
2. Listed products for termination, coupling, extending, benching supports of raceways shall be used.
3. Raceways/boxes described by this section shall include, but not be limited to, power for site utilities and lighting, site and building communications, controls, fire alarm, security, access control, sound systems, data system, energy management systems, power distribution, lighting, lighting controls, video, CATV, voice communications, intercom, nurse call, HVAC and other building low voltage/communications systems controls as may be required.
4. Protection of and cleanliness of pathways and raceways must be assured during the construction process in order to eliminate the possibility of debris entering the conduit, duct, pathway resulting in decreased wire capacity and potential damage to installed conductors and cables.

5. Pathways are shown in a diagrammatic way and are generally accurate as to routing, however, it is the Contractor's responsibility as a means and methods process to coordinate with all other trades that require space within a building. The Contractor shall obtain approval for installation of raceways routing through structural footings, retaining walls, columns, beams, purlins, grade beams, etc.
6. It is the Contractor's responsibility to insure that all raceway and boxes systems penetrate fire assemblies and sound rated assemblies in an approved manner using the appropriate and listed products for the purpose.
7. Trenching and backfilling for all underground conduit systems installed by the Electrical Contractor shall be the responsibility of the Contractor. Conduits shall have minimum cover requirement of 36" below finish grade. Joint trenching may be utilized where practicable and where permitted by this specification. Concrete, native material and sand shall be used as backfill material and shall be compacted in accordance with and coordinated with the grading and site preparation requirements. Conduits shall rest in a minimum of 4" bed of sand prior to backfill and compaction. Locations of existing underground (UG) utility systems shall be determined by calling Underground Service Alert (USA) at least 48 hours prior to any excavation.
8. Minimum conduit size shall be 1/2" except if plan shows or code requires larger size. Exception: Use minimum 3/4" for underslab and below grade applications outside of building exterior walls.
9. All electrical systems shall be installed in an approved conduit system. This shall include but not be limited to all systems described in Section B.3 above, except for voice and data systems which shall be installed as described on these plans and as specified here-in but shall not be less than the recommendations of EIA/TIA standards.
10. All line voltage wiring within the building shall be installed in metallic conduit.
11. All conduit, concrete pads, underground concrete or fiberglass substructures shall be furnished and installed with the approved materials and type for the application. Provide proper traffic control during construction as well as barriers and protection of all excavations and trenching.
12. Empty or future conduits shall be properly plugged with plastic caps or inserts with a 3/8" polyethylene pull rope. Plastic or "duct" tape will not be acceptable.
13. Exterior installations: After conductors are installed, seal conduit ends to prevent entrance of foreign material using pliable duct seal, caps or waterproof expanding foam.
14. All low voltage systems including intercom, fire alarm, public address, etc. shall be in dedicated conduit systems. Voice / Data and Direct Digital Control (DDC) systems for HVAC cabling shall be routed as specified in Section 271300, INTERCOMMUNICATIONS SYSTEMS and as recommended by EIA/TIA standards. It shall be the contractor's responsibility to provide raceway down walls to outlet boxes and to provide sleeves across inaccessible ceiling spaces.
15. Underground conduits entering building shall have the open end of conduit within building above the elevation of the conduit outside the building such that water cannot enter building through conduit. If such a condition exists, a pull box outside of building footprint shall be installed in conduit route before conduit enters building whereby top of pull box is below finish floor of building and moisture may exit box before entering building.
16. No single conduit run of any type shall exceed 300 degrees of radius bend from termination box to termination box.

17. Separate Raceway System: Provide a separate dedicated raceway system for each system installed, do not combine different systems into a raceway or cable tray system, unless otherwise noted or allowed.
18. Spare, Future Conduits: Conduits labeled conduit only, spare, or for future use, shall be provided with a pullrope, capped at each end, labeled as spare with destination marked, and turned over to the Owner in an unused state. Contractor shall not utilize these conduits for the installation of cabling or conductors as part of this scope of work. Contractor to verify and install at no additional cost to the Owner, additional conduits as required for the installation of the systems being installed.
19. Outlet System: Provide electrical boxes and fittings as required for a complete installation. Including but not limited to outlet boxes, junction boxes, pull boxes, bushings, locknuts, covers and all other necessary components.
20. Code Compliance: Comply with CEC as applicable to construction and installation of electrical boxes and fittings and size boxes according to CEC 300, 312, 314 and 366 except as noted otherwise.
21. Outlets to be flush mounted: Maintain integrity of insulation and vapor barrier. Unless otherwise noted, flush mount all outlet boxes.
22. Provide putty pads of proper type around outlet boxes and/or as detailed on plan to meet sound transmission restrictions and fire ratings of walls, refer to architectural drawings for fire rated and sound rated assemblies.

1.3 SUBMITTALS

- A. Provide Shop Drawings and Product Data for the Following Equipment:
 1. Conduit and fittings.
 2. Outlet boxes.
 3. Weatherproof outlet boxes.
 4. Junction and pull boxes.
 5. Cabinets, termination cabinets.
 6. Gutters.
 7. Concrete boxes and vaults.
 8. Putty pads.
 9. Raceways

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of the CEC, latest adopted version with amendments by local AHJs.
- B. Furnish products listed by UL or other independent and nationally recognized testing firm.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Heavy wall Rigid Non-Metallic Conduit, shall be PVC schedule 40 manufactured in accordance with NEMA Standard TC-2, UL-651 and WC 1094A specifications.
- B. Extra heavy wall non-metallic conduit, shall be PVC schedule 80 manufactured in accordance with NEMA Standard TC-2, UL-651 and WC 1094A specifications.
- C. Galvanized Rigid Steel (GRS) conduit shall be hot dipped galvanized, zinc coated and shall comply with Underwriters Laboratories UL-6, ANSI Specification C-80.1 and Federal Specification WW-C-581E.
- D. Electrical Metallic Tubing (EMT) shall be zinc coated, with a protective coating applied to the inside surface and shall comply with Underwriter Laboratories UL-797 ANSI Specification C-80.3 and Federal Specification WW-C-563A.
- E. Electrical Non-Metallic Tubing (ENT), shall be listed to requirements of U.L. 1653, in accordance with CEC Article 362, and meet requirements of BI National Standard CAN/CSA-C22.2 No. 227.1-U.L. 1653. ENT shall be rated for 90 degrees C conductors and shall be recognized for use in 2-hour fire resistance non-load bearing and load bearing wall assemblies. ENT shall be recognized for through-penetration firestop systems as classified to meet U.L. and ICC building codes.
- F. Flexible Metal Conduit (FMC) shall be continuous wound reduced wall galvanized steel produced to UL standards.
- G. Liquid tight flexible metal conduit shall have a thermoplastic cover over a galvanized steel core containing an integral copper ground in sizes to 1 1/4" and shall be in compliance with UL standards and CEC Article 350.
- H. Surface mount raceway shall only be used where shown on the plans. The raceway and cover shall be white, in color but shall be capable of being over-painted in the field if required. The raceway and fittings shall meet all requirements of CEC Article 386 and be U.L. listed. Raceway shall be mechanically connected to structure with backing and anchor bolts. Surface mounted raceways for new fire alarm system shall be surface mounted EMT conduit and surface mounted outlet boxes.
- I. Manufacturers:
 - 1. Outlet Boxes: Bowers, Raco, Steel City or equal.
 - 2. Weatherproof Outlet Boxes: Bell, Red Dot, [Carlon] or equal.
 - 3. Junction and Pull Boxes: Circle AW, Hoffman, Wireguard or equal.
 - 4. Box Extension Adapter: Bell, Red Dot, [Carlon] or equal.
 - 5. Conduit Fittings: O-Z Gedney, Thomas & Betts, or equal.
 - 6. Vaults: Christy, Brooks, Utility Vault or equal.

7. Putty pads: 3M, Hilti, or equal.
8. Heavy wall rigid non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
9. Extra heavy wall non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
10. Galvanized Rigid Steel (GRS) conduit shall be hot dipped galvanized, zinc coated and shall comply with Underwriters Laboratories UL-6, ANSI Specification C-80.1 and Federal Specification WW-C-581E.
11. Electrical Metallic Tubing (EMT) shall be zinc coated, with a protective coating applied to the inside surface and shall comply with Underwriter Laboratories UL-797 ANSI Specification C-80.3 and Federal Specification WW-C-563A.
12. Electrical Non-Metallic Tubing (ENT), shall be listed to requirements of U.L. 1653, in accordance with CEC Article 362, and meet requirements of BI National Standard CAN/CSA-C22.2 No. 227.1-U.L. 1653. ENT shall be rated for 90 degrees C conductors and shall be recognized for use in 2-hour fire resistancaboe non-load bearing and load bearing wall assemblies. ENT shall be recognized for through-penetration firestop systems as classified to meet U.L. and ICC building codes. ENT is only approved for fire alarm and communication systems cabling.
13. Flexible Metal Conduit (FMC), Alfex, American Flexible Conduit or equal.
14. Liquid tight flexible metal conduit, Anacanda (type UA), Electri-flex Liquatite or equal.
15. Surface mount raceway, Wiremold, Three Compartment Series 5500 or equal
16. Masonry Boxes, outlets in concrete, Raco Series 690 or equal.
17. Exterior In-Grade Boxes for Non-Utility Company, Precast concrete or polymer concrete, Utility Vault and Christy.

2.2 OUTLET BOXES

- A. NEMA 1 gutter, junction and pull boxes shall be fabricated from code gage steel finished in grey enamel with screw cover fronts and concentric knockouts in all sides.
- B. NEMA 3R gutter, junction and pull boxes shall be fabricated from code gage galvanized steel with screw cover fronts and concentric knockouts in the bottom only. Any penetrations to the side, top or back shall be weatherproofed in an approved manner such as "MYERS" gasketed type hub or equal.
- C. Steel outlet boxes and plaster rings shall be galvanized rigid assemblies, either one piece pressed or factory welded construction containing the size and number of knockouts required. Steel outlet boxes shall be manufactured, sized and installed in accordance with CEC Article 314. Device Outlet: Installation of one or two devices at common location, minimum 4" square, minimum 1 1/2" deep. Single or 2 gang flush device plaster ring. Raco Series 681 and 686 or equal.
- D. Luminaire Outlet: minimum 4" square with correct plaster ring depth, minimum 1 1/2" deep with 3/8" luminaire stud if required. Provide proper depth plaster ring on bracket outlets and on ceiling outlets.

- E. Multiple Devices: Three or more devices at common location. Install 1 piece gang boxes with 1 piece device plastering. Install one device per gang unless otherwise allowed.
- F. Construction: Provide galvanized steel interior outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices. Boxes shall be properly secured to the structure such that they are flush with the finish surface. Boxes shall be made structurally secure by means of the proper fastening devices.
- G. Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, plaster rings, luminaire studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.

2.3 WEATHERPROOF OUTLET BOXES

- A. Surface mounted die cast aluminum device boxes shall be provided with screw holes to accommodate cast device covers.
- B. Cover plates on outlet boxes mounted flush in the wall shall be gasketed to the wall in a watertight manner. Weatherproof boxes in wet locations as described in CEC 406.8 (B) shall be provided with a "while-in-use" cover; red dot 'CK' Series of aluminum die-cast construction, NEMA 3R, with lacquer finish.

2.4 JUNCTION AND PULL BOXES

- A. Construction: Provide galvanized sheet steel junction and pull boxes, with screw-on covers; of the type shape and size, to suit each respective location and installation; with welded seams and equipped with steel nuts, bolts, screws and washers.
- B. Location:
 - 1. Install junction boxes above accessible ceilings for drops into walls for receptacle outlets from overhead.
 - 2. Install junction boxes and pull boxes as required to facilitate the installation of conductors and limiting the accumulated angular sum of bends between boxes, cabinets and appliances to 300 degrees.
 - 3. Locations: Junction boxes shall be located only where necessary and only in equipment rooms, closets, and accessible attic and underfloor spaces. A horizontal distance of 24" shall separate outlet boxes on opposite sides of occupancy separation walls, fire-rated walls or partitions.
 - 4. Labeling: Junction box covers shall be marked with indelible ink indicated the circuit numbers passing through the box.

2.5 BOX EXTENSION ADAPTER

- A. Construction: Diecast aluminum
- B. Location: Install over flush wall outlet boxes to permit flexible raceway extension from flush outlet to fixed or movable equipment.

2.6 CONDUIT FITTINGS

- A. Requirements: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and plastic conduit bushings of the type and size to suit each respective use and installation.
- B. Steel boxes may allow for field knock-out modifications, but shall in all other ways conform to code requirements.

2.7 EXTERIOR IN-GRADE BOXES FOR NON-UTILITY COMPANY USE SHALL BE:

- A. Pull boxes 24" x 36" and larger shall be provided with factory concrete bottom base.
- B. Contractor to provide field poured bottom base for pull boxes 11" x 17" and smaller.
- C. All pull boxes shall be set on a minimum of 24" gravel or class II base.
- D. All pull boxes located in landscape areas shall be 1" above landscape to avoid water intrusion, all pull boxes located in flatwork shall be higher than adjacent flatwork to avoid water intrusion, contact district directly to confirm requirements.
- E. Provided with full vehicular traffic type lid.

2.8 PUTTY PADS

- A. Intumescent moldable firestop putty designed to protect electrical outlet boxes.
- B. Designed to install around outside of outlet boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Conduit systems listed below are for use in installations where they are permitted to be used by CEC and/or other occupancy restrictions. The below installation methods do not intend to suggest that these materials be installed in conflict with any applicable code. Special attention to

applications shall be made in building types such as Educational, Health Care, wet location, hazardous locations, assembly occupancy and multi-story, but not limited to these. Requirements which are more restrictive than the CEC may be called for by the drawings and / or these specifications. These requirements must be adhered to. The Electrical Contractor shall be responsible to use the proper conduit system for the application. Exposed conduit is not allowed below ceilings or above slab of floor, without the permission and approval of the Architect. All conduits shall be concealed except in electrical and telecommunication rooms or where shown to be surface mounted. Exposed conduit (where allowed) shall be run square and plumb with building lines in an approved manner. Support roofmount conduits, where allowed, with minimum 12" wide redwood blocks set in mastic unless otherwise detailed in roof requirements or as specified in roofing specification, by the Architect. Strap conduits to blocks with proper sized conduit straps. Spacing of support shall be a minimum as provided for in the CEC. All exposed conduit mounted below 8' above finished grade shall be strapped at a minimum of 5' spacing.

- B. Non-Metallic Rigid Conduit shall be used in concrete slabs, below concrete slabs on grade, or underground outside of a building slab or foundation. Maintain minimum depth requirements and cover with appropriate fill material. Minimum 4" of bedding and cover of backfill material 1/4" size grain and smaller maximum. Conduit shall be heavy wall Schedule 40 or 80, rigid PVC only. Rigid utility P&C duct shall not be used in any application. Properly sized grounding conductors shall be installed per CEC article 250, in all non-metallic conduit branch circuit and feeder runs. PVC conduit shall be formed or field bent only with the use of properly approved bending tools such as to not decrease the internal bore of the conduit. All conduits shall be cut square and reamed of burrs. Approved and compatible glue shall be used on all PVC fittings to attain watertight joints.
- C. Galvanized Rigid Steel (GRS) conduit shall be used where exposed less than 8'-0" above finished grade to 18" below finished grade and where subject to physical damage. Conduits shall be cut square and reamed to remove burrs and sharp edges. Strap conduit below 8' above grade at 5' intervals. Unless otherwise noted, threadless setscrew and threadless weathertight fittings may be used in lieu of threaded fittings. All threaded ends entering a junction box of any type shall require one locknut on the inside and one on the outside of the enclosure and be provided with a plastic bushing or grounding bushing where necessary for proper grounding. Where exposed to moisture, a watertight hub or other approved method shall be required. All conduits shall be stubbed up straight and uniform into junction boxes, panels, cabinets, etc., and shall be (GRS) properly supported and strapped. All GRS conduit located below grade, shall be tape wrapped.
- D. Electrical Metallic Tubing (EMT) shall be used as allowed by code and as permitted by this specification. It shall not be in contact with soil or the concrete slab on the ground floor of any structure. Connectors and couplings shall be steel insulated set screw type where installed in indoor dry locations not subject to moisture. Where the potential for moisture is present, compression type weathertight fittings are required. One hole conduit straps are permitted from 1/2" to 1" and two hole conduit straps are required for size 1 1/4" and larger. EMT shall not be allowed in areas subject to physical damage. Install copper ground wire sized per CEC 250-122 in all EMT conduits.

- E. Electrical Non-Metallic Tubing (ENT) shall be installed in accordance with its listed application. ENT shall not be used for line voltage conductors. Only listed cement shall be used for connectors, coupling, fittings requiring cement. Unless otherwise noted, ENT systems shall be color coded: yellow for communications systems, and red for fire alarm systems. Use only approved and listed accessories ENT shall not be used for fire alarm system cabling in 'A' type occupancies, refer to architectural plans for 'A' type occupancy locations, EMT is required for fire alarm system cabling in 'A' type occupancies.
1. Electrical Nonmetallic Tubing (ENT) is designed to replace EMT, flexible metal conduit or other raceway or cable systems, for installation in accordance with Article 362 of the National Electrical Code, Section 12-1500 of the CEC, other applicable sections of the Code, and local codes.
 2. Any ENT used shall be listed to the requirements of UL Standard UL 1653 in accordance with Article 362 of the NEC and Section 12-1500 of the CEC.
 3. Any ENT used shall meet the requirements of BI National Standard CAN/CSA-C22.2 No. 227.1-UL1653 and shall be Listed/Certified in accordance to the Electrical Codes.
 4. Carlon's ENT shall be installed per the technical assessment prepared by fire cause analysis for use in 1-hour and 2-hour rated construction.
 5. Penetration of fire rated walls, floors or ceilings shall use Classified Through-Penetration Firestop Systems described in the current Underwriters Laboratories Fire Resistance Directory.
 6. Fittings and outlet boxes shall be designed for use with ENT shall be listed. All fittings, boxes and accessories shall be from one manufacturer.
 7. Only Carlon ENT Blue cement recommended specifically for use with ENT and rigid nonmetallic fittings shall be used.
 8. Unless indicated differently on drawings, ENT systems shall be color coded: YELLOW for communications, and RED for fire alarm systems.
 9. ENT, fittings, and accessories shall be manufactured by Carlon.
 10. ENT shall not be used or allowed in any application where not allowed by CEC Article 362.
- F. Flexible conduit may be used where concealed in building construction or above dropped ceilings, but shall meet the following criteria: No individual circuit path from distribution panel to last device shall exceed a cumulative length of 6' of flexible conduit from start to end. Flexible conduit shall not exceed a total directional change of 270 bending degrees in any one run between conduit terminations. Squeeze type or Jake type steel flex fittings of a grounding type are required. Flexible conduit must be supported in accordance with CEC. Where exposed to the weather, moisture, or spray down flexible conduit shall be of the liquidtight type. Fittings shall be manufactured for use with liquidtight flexible conduit. All motor connections shall be made with liquidtight flex. Flexible conduit may not be used where exposed except for last 2' of equipment connection and unless otherwise noted or approved. A copper ground wire sized per CEC 250-122 shall be installed in all flexible conduit runs. Flexible conduit may not be used exposed. Weatherproof liquid tight conduit shall not be used at roof level for equipment connections with lengths exceeding 24" nor shall it be used to circumvent a rigid conduit system in a horizontal direction. Connect recessed lighting fixtures to conduit runs with a maximum of 6' of flexible metal conduit extending from junction box to fixture.

- G. Underground conduits and transition to above grade/slab shall be as follows:

1. PVC elbows allowed if top of elbow is minimum 18" BFG or below top of slab, otherwise GRS elbows are required.
 2. GRS elbows are required if conduit run is 150' or greater.
 3. GRS risers are required from elbow below grade to equipment (device, outlet, panel, cabinet, etc.) above grade.
 4. GRS elbows/risers to be PVC coated or 10 MIL taped wrapped (1/2" lapped) to 3" above finish grade or top of slab.
- H. Conduit Supports: Conduit runs may be supported by one-hole and two-hole straps or supports as manufactured by Unistrut, Minerallac, Caddy or equals. Supports may be fastened by means of anchors, shields, beam clamps, toggle bolts, or other approved methods appropriate for the application and size of conduit. Pipe nailers (J-hooks) may only be used for 1" conduit and smaller and only in wood frame construction. Conduit support methods are subject to review by the engineer and authority having jurisdiction for adequacy. Conduits shall be supported independent of all other trades, all conduit supports shall be dedicated to conduit system. Installations deemed inadequate shall be corrected by the contractor at no cost to the Owner.
- I. Bends and offsets shall be made with approved tools for the type of conduit being utilized. Bends shall be made without kinking or destroying the smooth bore of the conduit. Parallel conduits shall be run straight and true with bends uniform and symmetrical. Minimum radii shall be per CEC 344-24.
- J. Conduit Stub-outs below grade shall be capped with plastic cap, and identified by placing a pull box marked with correctly identified utility such as "Elec", "Tel", etc. Dimension for exact location on field record drawings. Provide lids for proper field application (i.e. traffic, incidental, pedestrian).
- K. Conduit Seals: Where below grade conduits enter structure through slab or retaining wall of building or basement, seal the inside of each conduit as follows:
1. Provide damming material around conductors 3" into conduit.
 2. Fill 3" of conduit with 3M #2123 sealing compound.
 3. Wrap conductors where they exit the conduit with 3M #2229 "Scotch Seal" mastic tape. Lap tape to approximate diameter of the raceway and wrap outside of conduit opening with (minimum) one turn.
 4. Use conduit sealing bushings type CSB (O-Z/Gedney) or equal.
 5. Empty conduits shall be sealed with standard non-hardening duct seal compound and then capped to prevent entrance of moisture and gases and to meet fire resistance requirements.
 6. Provide cable drip loop minimum 12" high.
- L. Marker tape: Place plastic yellow marker tape at 12" below finish grade along and above buried conduits. Label tape "CAUTION: ELECTRICAL LINES BELOW" or similar wording.
- M. Electrical and communications systems raceways routed underground shall not occupy the same trench as plumbing utilities such as sewer, water, storm drain, gas or other wet or dry gaseous utility system. A minimum of 12" of undisturbed earth is required. Where utilities must cross in

closer proximity to each other due to physical constraints, 6" minimum crossing distances are allowed, however 18" on all sides of a utility crossing must be concrete encased.

- N. Duct bank defined here-in shall be four or more conduits in a common trench, conduit spacers and saddles shall be required in all trenches where more than two conduits over 2" in diameter travel in the same trench. Proper spacing between systems as outlined above shall be required and spacers shall be located each 5' (maximum) along trench route from point to point.
- O. Conduits, routed below footings, slabs, grade beams, columns, and other structural elements shall be installed in strict compliance with structural details and criteria shown on structural plans. Clearances below structural elements and sleeves through structural elements must be carefully planned to avoid conflict and must be approved by the structural engineer if conflict arises.
- P. All conduit or raceways passing through fire rated walls, floors, or ceilings shall be installed with a listed penetration method which protects the opening to the same rating as the assembly and is non hardening.
- Q. Expansion Joints
 1. Conduits 3" and larger, that are secured to the building structure on opposite sides of a building expansion joint, require expansion and deflection couplings. Install the couplings in accordance with the manufacturer's recommendations.
 2. Provide conduits smaller than 3" with junction boxes on both sides of the expansion joint. Connect conduits to junction boxes with sufficient slack of flexible conduit to produce 5" vertical drop midway between the end. All conduit shall have a copper green grounding bonding conductor installed.
- R. Seismic Joints
 1. At seismic joints, provide conduits rigidly secured to the building structure on opposite sides of a building expansion joint with junction boxes or approved fittings, on both sides of the joint. Connect conduits to junction boxes with sufficient slack flexible conduit such that these slack conduits are 1 1/2 times the distance between conduit ends. Flexible conduit shall have a copper green ground bonding jumper installed.
- S. Location: Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.
- T. Anchoring: Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.
- U. Special Application: Provide weatherproof outlets for locations exposed to weather or moisture.
- V. Knockout Closures: Provide knockout closures to cap unused knockout holes where blanks have been removed.
- W. Mount outlet boxes as noted on drawings, the following distances above the finished floor:
 1. Receptacles, Telephone, TV & Data outlets. (measured to bottom of outlet box): +15".
 2. Outlet above counter (measured to top of outlet box): +46".
 3. Control (light) Switches. (measured to top of outlet box): +48".

4. Fire Alarm Manual Pull Stations, T-stats. (measured to top of outlet box): +48".
 5. Fire Alarm Visuals: the lower of +80" to bottom of lens, or 6" below ceiling.
 6. Other Outlets: As indicated in other sections of specifications or as detailed on drawings.
- X. Coordinate all electrical device locations with the architectural floor plan and interior and exterior elevations to prevent mounting devices within elements that they may conflict such as cabinetry, mirrors, planters, etc.
- Y. Size outlet and junction boxes to minimum wire fill space requirements. Upsize box as required to allow ease of wire installation and device installation.
- Z. Outlet and junction boxes in fire rated walls shall be gauged and spaced so as not to exceed the maximum penetration allowed by the assembly without compromising the fire rating. If a conflict arises relative to a specific condition, the contractor shall follow the requirements of the fire authority and ask for guidance from the design team. At no time should a larger box be installed prior to resolution of conflict.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:

- 1. Nameplates and warning signs where specified herein and as shown on contract documents including the following:
 - a. Nameplates and warning signs permanently installed on all electrical equipment and devices including, but not limited to, the following items:
 - 1) Enclosures for switchboards, panels, pullboxes, cabinets, motors, inverters.
 - 2) Enclosures for all separately enclosed devices including, but not limited to, disconnect switches, circuit breakers, contactors, time switches, control stations and relays, fire alarm panels and lighting control panel.
 - 3) Wall switches not within sight of outlet controlled.
 - 4) Special systems such as, but not limited to, telephone, fire alarm, warning and signal systems. Identification shall be at each equipment rack, terminal cabinet, control panel, annunciator and pullbox.
 - 5) Devices mounted within and part of equipment including circuit breakers, switches, control devices, control transformers, relays, indication devices and instruments.
- 2. Conductor and Cable Identification.

- B. Related Work:

- 1. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- 2. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.
- 3. Section 262416, PANELBOARDS.
- 4. Section 262816, ENCLOSED SWITCHES AND CIRCUIT BREAKERS.
- 5. Section 260534, CABINETS.
- 6. Section 262413, SERVICE AND DISTRIBUTION SWITCHBOARD.

1.2 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABEL DESIGNATIONS

- A. Equipment labels indicating equipment designations both emergency and normal. Designation data per drawings or to be supplied with shop drawings approval.
- B. Panelboard labels showing panel designation, voltage, phase and source.
- C. In accordance with CEC 110.16, provide arc flash protection warning labels on all switchboards, panelboards, distribution panels, transformers, safety switches, transfer equipment, etc. Labels shall be per ANSI Z535.4 guidelines.

2.2 MATERIALS

- A. For Labels: Three layer laminated plastic or micarta with engraved white letters over black background.
- B. For Emergency Equipment: Use engraved white letters over red background.
- C. For Warning Signs: Minimum 18 gauge steel with red lettering on white porcelain enamel finish.
- D. Arc flash labels shall be provided as required by CEC Article 70E.
- E. Conductor tape number markers: ABB Thomas and Betts WM-0-45 Series non-fading permanent adhesive.

PART 3 - EXECUTION

3.1 MOUNTING

- A. Equipment labels shall be mounted by self-tapping, threaded screws and bolts, or by rivets. Adhesive types are not acceptable unless specifically noted in this section.
- B. Conductor tape markers shall be consistently placed for ready conductor identification.

3.2 HEIGHTS ON LABELS

- A. Panelboards, Switchboards and Motor Control Centers and Special Systems Enclosures: 1/4" identify equipment designation; 1/8" identify voltage rating and source.
- B. Individual Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, and Motor Control Centers: 3/16" identify circuit and load served, including location of equipment.
- C. Enclosed Circuit Breakers, Enclosed Switches, and Motor Starters: 3/16" identify load served.

- D. Transformers: 3/16" identify equipment designation; 1/8" identify primary and secondary voltages, primary source and secondary load. Include location of primary source or secondary load if remote from transformer.

3.3 WARNING SIGNS

- A. Warning signs shall be permanently mounted with cadmium plated steel screws or nickel-plated brass bolts.
- B. Warning signs to read "DANGER - HIGH VOLTAGE", with letters 1 1/2" high, 3/16" stroke minimum.
- C. Provide warning sign on all doors or immediately next to door for equipment rooms, enclosures or closets containing equipment energized above 150 volts to ground as per CEC, and/or as directed by the Architect. For interior finish spaces and interior doors, signage shall be coordinated and approved with the Architect in advance of installation.

END OF SECTION 260553

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SECTION 262416 – PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Panelboards.
- B. Related Work:
 - 1. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
 - 2. Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.
 - 3. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Cables and wiring.
 - 4. Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

1.3 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.

1.4 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. Underwriters Laboratories, Inc. (UL):
 - 1. No. 50 Enclosures for Electrical Equipment
 - 2. No. 67 Panelboards
 - 3. No. 489 Molded Case Circuit Breakers and Circuit Breaker enclosures
- C. National Fire Protection Association (NFPA):
 - 1. No. 70-2022 California Electrical Code (CEC)
- D. National Electrical Manufacturers Association (NEMA):

1. No. PB-1 Panelboards.
2. No. AB-3 Molded Case Circuit Breakers and Their Application.

PART 2 - PRODUCTS

2.1 PANELBOARDS

- A. Panelboards shall be in accordance with UL, NEMA, NEC, CEC and as shown on the drawings. Approved manufacturers are Eaton, Schneider Electric.
- B. Panelboards shall be standard manufactured products. All components of the panelboards shall be the product and assembly of the same manufacturer. All similar units of all panelboards to be of the same manufacturer.
- C. All panelboards shall be dead front safety type. Arrange sections for easy removal without disturbing other sections.
- D. All panelboards shall be completely factory assembled with molded case circuit breakers. All factory wiring shall be checked for correct tightness and visually inspected to insure that bussing and terminations have not become loose in transit to job site.
- E. Panelboards shall have main breaker or main lugs, bus size, voltage, phase, top or bottom feed, and flush or surface mounting as scheduled on the drawings. Refer to single line diagram and panel schedules on drawings. Terminals shall be minimum 75 degree rated. Back fed main circuit breakers are not allowed. Main circuit breakers shall be vertically mounted.
- F. Panelboards shall have the following features:
 1. Nonreduced size copper bus bars, and connection straps bolted together and rigidly supported on molded insulators. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of branch circuit devices.
 2. Full size neutral bar, mounted on insulated supports.
 3. Ground bar with sufficient terminals for all grounding wires.
 4. Panelboard bus shall be braced for the available short circuit current.
 5. All breakers and phase bus connections shall be arranged so that it will be possible to substitute a 2-pole breaker for two single pole breakers, and a 3-pole breaker for three single pole breakers, when trip is 30 amps or less and frame size is 100 amperes or less, without having to drill and tap the main bus bars at bus straps. Where used for heating and air conditioning, and refrigeration equipment, use only HACR type U.L. listed circuit breakers.
 6. Design interior so that protective devices can be replaced without removing adjacent units, main bus connectors, and without drilling or tapping.
 7. Where designated on panel schedule as "space", include all necessary bussing, device support and connections. Provide blank cover for each space.

8. In two section panelboards, the main bus in each section shall be full size. The first section shall be furnished with subfeed lugs on the line side with cable connections to the second section. Panelboard sections with tapped bus or crossover bus are not acceptable.
 9. Series rated panelboards are not permitted.
 10. Recessed panel space conduit: Provide (1) $\frac{3}{4}$ inch spare conduit stubbed to accessible ceiling space and/or interstitial space below floor for every (5) spaces and spares indicated on panel schedules.
- G. Panelboards serving as building mains shall be "service entrance rated" and UL Listed as "service equipment".

2.2 CABINETS AND TRIMS

A. Cabinets:

1. Provide galvanized steel cabinets to house panelboards. Cabinets for outdoor panels shall be factory primed and suitably treated with a corrosion-resisting paint finish meeting UL standard for outdoor applications.
2. All ventilated openings in panelboards and switchboards, shall be furnished with dust filters to prevent entrance of dust and debris.
3. Cabinets for panelboards may be of one piece formed steel or of formed sheet steel with end and side panels welded, riveted, or bolted as required.
4. Provide necessary hardware for "in" and "out" adjustment of panel interior.
5. Cabinets for two section panelboards shall be arranged side by side, and shall be the same height. Flush mounted cabinets should be 1 1/2" apart and coupled by conduit nipple if necessary.
6. Gutter size in panel boxes, on all sides, shall be in accordance with the CEC. Penetrations through gutter to live area of the panelboard shall incorporate approved non-metallic-grommet type of insulation to protect wire passing through.

B. Trims:

1. Fabricate trim of sheet steel consisting of frame with door attached by concealed hinges. Provide flush or surface trim as shown on the drawings.
2. Flush trims shall overlap the box by at least 3/4" all around.
3. Surface trim shall have the same width and height as the box.
4. Flush or surface trims shall not have ventilating openings.
5. Secure trims to back boxes by indicating trim clamps.
6. Provide a welded angle on rear of trim to support and align trim to cabinet.
7. Provide separate trims for each section of multiple section panelboards. Trims and doors of sections shall be of the same height.

C. Doors:

1. Provide doors with flush type latch and manufacturer's standard lock. Doors over 48 inches in height shall have a vault handle and a three-point catch, arranged to fasten door at top, bottom, and center.
2. In making switching devices accessible, doors shall not uncover any live parts.

3. Provide concealed hinges welded to the doors and trims.
4. For lighting or power contactors incorporated in panelboards, provide separate doors for the contactors.
5. Provide keyed alike system for all panelboards.
6. Provide a directory card, metal holder, and transparent cover. Permanently mount holders on inside of doors.

D. Painting:

1. Thoroughly clean and paint trims and doors at the factory with primer and manufacturer's standard finish.

2.3 MOLDED CASE CIRCUIT BREAKERS FOR PANELBOARDS

- A. Breakers shall be UL listed and labeled, in accordance with the CEC, as shown on the drawings, and as specified.
- B. Circuit breakers in panelboards shall be bolt on type on phase bus bar or branch circuit bar.
1. Molded case circuit breakers for lighting and appliance branch circuit panelboards shall have minimum interrupting rating as indicated.
 2. Molded case circuit breakers shall have automatic, trip free, non-adjustable, inverse time, and instantaneous magnetic trips for 100 ampere frame or less. Magnetic trip shall be adjustable from 3 times to 10 times for breakers with 600 ampere frames and higher. Factory setting shall be HI, unless otherwise noted.
- C. Breaker features shall be as follows:
1. Integral housing of molded insulating material.
 2. Silver alloy contacts.
 3. Arc quenchers and phase barriers for each pole.
 4. Quick-make, quick-break, operating mechanisms.
 5. A trip element for each pole, thermal magnetic type with long time delay and instantaneous characteristics, a common trip bar for all poles and a single operator.
 6. Electrically and mechanically trip free.
 7. An operating handle which indicates ON, TRIPPED, and OFF positions.
 - a. Line connections shall be bolted.
 - b. Interrupting rating shall not be less than the maximum short circuit current available at the line terminals as indicated on the drawings. The interrupting rating shall not be less than the minimum identified requirement.
 8. An overload on one pole of a multipole breaker shall automatically cause all the poles of the breaker to open.

2.4 SEPARATELY ENCLOSED MOLDED CASE CIRCUIT BREAKERS

- A. Where separately enclosed molded case circuit breakers are shown on the drawings, provide circuit breakers in accordance with the applicable requirements of those specified for panelboards.

- B. Enclosures are to be of the NEMA types shown on the drawings. Where the types are not shown, they are to be the NEMA type most suitable for the environmental conditions where the breakers are being installed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with CEC, as shown on the drawings, and as specified.
- B. Locate panelboards so that the present and future conduits can be conveniently connected. Coordinate the sizes and layout of cabinets within the designated spaces. All equipment must be dimensioned in order to physically fit in the spaces provided and to comply with all code required clearances.
- C. Install a typewritten schedule of circuits in each panelboard. Include the room numbers (as finally described by the Owner) and items served on the cards. Obtain final room numbers from Architect prior to creating schedule.
- D. Mount the panelboard so that maximum height of the top circuit breaker above finished floor shall not exceed 78 inches.
- E. For panelboards located in areas accessible to the public, paint the exposed surfaces of the trims, doors, and boxes with finishes to match surrounding surfaces after the panelboards have been installed.
- F. Circuit numbers shall correspond to the approved panel schedule. Provide as-built drawings showing the actual circuit numbers being used for each device on each branch circuit if changes are required.
- G. Verify depth of all flush mounted enclosures in walls to be certain wall depth will accommodate panel depth prior to installation.
- H. All openings in switchgear and panelboards that are unused shall be sealed with bolts and washers. Use caulking where holes or openings cannot be sealed by way of a washer, or bolts or conduit seals.
- I. Contractor shall include the services of an independent testing company to test GFI circuit breakers in distribution and main panelboards.

END OF SECTION 262416

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SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Wiring devices.

1.3 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Related Work:
 - 1. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
 - 2. Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.
 - 3. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.
 - 4. Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

PART 2 - PRODUCTS

2.1 RECEPTACLES

- A. General: All receptacles shall be listed by Underwriters Laboratories, Inc.
 - 1. Mounting straps shall be plated steel, with break-off plaster ears and shall include a self-grounding feature (this feature does not substitute for a grounding conductor terminated on grounding strap of device). Terminal screws shall be brass, brass plated or a copper alloy metal.
 - 2. Receptacles shall be of a screw terminal type, "pressure type quick wire" terminations are not allowed.
 - 3. 15 ampere and 20 ampere, 125-volt and 250-volt non-locking receptacles shall be tamper resistant type receptacles unless the application is specifically listed as an exception to CEC 406.12.
 - 4. Receptacles shall be "wet rated" when used in an exterior location.

- B. Duplex receptacles shall be premium specification grade single phase, 20 ampere, 120 volts, 2-pole, 3-wire, and conform to the NEMA 5-20R configuration in NEMA WD 6. The duplex type shall have bussing break-off feature for two-circuit operation. The ungrounded pole of each receptacle shall be provided with a separate terminal.
1. Wiring device color shall be standard white. Contractor to verify device color with Architect prior to procurement.
 2. Controlled receptacles; installed per requirements of 2022 BUILDING ENERGY EFFICIENCY STANDARDS / Efficiency Standards, California Code of Regulations, Title 24, Part 6. SECTION 130.5 (d) – ELECTRICAL POWER DISTRIBUTION SYSTEMS as Circuit Controls for 120-Volt Receptacles and / or Controlled Receptacles. Shall be provided with an approved means of including a permanent and durable marking identifying the controlled receptacles or circuits to differentiate them from uncontrolled receptacles or circuits. Where shown on associated floor plans, and or required by the Standards; a duplex noted to be controlled shall be 'split-wire', so the top outlet shall be switched and the bottom outlet shall be unswitched. A double duplex (fourplex) noted to be controlled: one of the duplex receptacles shall be controlled and the other duplex receptacle shall be unswitched.
 3. Ground Fault Interrupter Duplex Receptacles: Shall be an integral unit suitable for mounting in a standard outlet box.
 - a. Ground fault interrupter shall be commercial grade and consist of a differential current transformer, solid state sensing circuitry and a circuit interrupter switch. It shall be rated for operation on a 60 Hz, 120 volt, 20-ampere branch circuit. Device shall meet CEC requirements. Device shall have a minimum nominal tripping time of 1/30th of a second. Devices shall meet UL 943.
- C. Receptacles; 20, 30 and 50 ampere, 250 volts: Shall be complete and match with appropriate cord grip plug. Devices shall meet UL 231.
- D. Weatherproof Receptacles: Shall consist of a listed weather resistant duplex receptacle, mounted in box with a gasketed, while in use weatherproof, cast metal cover plate and cap receptacle opening. The cap shall be permanently attached to the cover plate by a spring-hinged flap. Approved manufacturers: Thomas & Betts/Red Dot 2CK Series, or engineer approved equal.
- E. Approved receptacles are Hubbell GF20 Series GFCI, Hubbell 5352.

2.2 SWITCHES

- A. Toggle switches shall be totally enclosed tumbler type with bodies of phenolic compound. Toggle handles color to match receptacle device color unless otherwise specified. Approved toggle switch is district standard Hubbell CSB120, no substitutions.
1. Shall be single unit toggle, butt contact, quiet AC type, heavy-duty general-purpose use with an integral self grounding mounting strap with break-off plaster ears and be of a screw terminal type.
 2. Shall be color coded for current rating, listed by Underwriters Laboratories, Inc., and meet the requirements of NEMA WD 1, Heavy-Duty and UL 20.

3. Ratings:
 - a. 120 volt circuits: 20 amperes at 120-277 volts AC.
 - b. 277 volt circuits: 20 amperes at 277 volts AC.
4. The switches shall be mounted on the strike plate side of doors.
5. Incorporate barriers between switches with multi-gang outlet boxes where required by the CEC.
6. All toggle switches shall be of the same manufacturer.
7. Key lockable switches shall be district standard Hubbell 122L, no substitutions.

2.3 WALL PLATES

- A. Wall plates for switches and receptacles shall be type 302 stainless steel.
- B. Standard NEMA design, so that products of different manufacturers will be interchangeable. Dimensions for openings in wall plates shall be in accordance with NEMA WD1.
- C. For receptacles or switches ganged together, wall plates shall be a single ganged plate.
- D. Wall plates for data, telephone or other communication outlets shall be as specified in the associated specification.
- E. Surface mounted boxes, NEMA1, shall be industrial grade raised galvanized steel covers. In shop areas all receptacles shall be dust proof and or waterproof where applicable.
- F. Waterproof device covers shall be cast iron, 4-corner screw type, for FS and FD type mounting. Device covers shall be zinc galvanized finish. Weatherproof covers shall be lockable.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Switches installed in hazardous areas shall be explosion proof type in accordance with the CEC and as shown on the drawings.
- B. Installation shall be in accordance with the CEC, NECA "Standard of Installation", and as shown as on the drawings.
- C. Ground terminal of each receptacle shall be bonded to the outlet box with an approved green bonding jumper, and also be connected to the green equipment grounding conductor.
- D. General: Devices shall be of the type specified herein. All devices shall be installed with "pigtailed" leads from the outlet box. No device shall be used in the "feed through" application. Screw terminals shall be used to connect all devices to the circuit and shall be grounded by means of a ground wire where grounding terminals are provided in the device.

- E. Installation: Devices and plates shall be installed in a “plumb” condition and must be flush with the finish surface of the wall where boxes are recessed.
- F. Mounting heights: All control and convenience devices shall comply with CBC, Chapter 11B accessibility requirements. Mounting heights indicated on plans shall have precedence.
- G. Install switches with the off position down.
- H. Clean debris from outlet boxes.
- I. Provide extension rings as required to bring outlet boxes flush with finished surface or casework.
- J. Test each receptacle device for proper polarity.

END OF SECTION 262726

SECTION 265100 – INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Interior lighting systems, including luminaires, ballasts, lamps and emergency lighting equipment.
- B. Related Work:
 - 1. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
 - 2. Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS: Conduits, fittings, and boxes for raceway systems.
 - 3. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low voltage power and lighting wiring.
 - 4. Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
 - 5. Section 265600, EXTERIOR LIGHTING.
 - 6. Section 265670, LIGHTING ACCEPTANCE TESTING.

1.3 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Shop Drawings:
 - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - 2. Include electrical ratings, dimensions, mounting, details, materials, terminations, wiring and connection diagrams, photometric data, ballasts, luminaires, lamps and controls.

1.4 MAINTENANCE

- A. Provide 10 percent spare drivers for each type of lighting fixture provided or a minimum of one spare driver per each type of fixture (whichever is greater) as loose items in manufacturers packaging to the owner. Deliver the product(s) to a location acceptable to the Owner.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM).
- C. American National Standards Institute (ANSI).
- D. Aluminum Association Inc. (AA).
- E. Illuminating Engineering Society of North America (IESNA).
- F. National Electrical Manufacturers Association (NEMA).
- G. National Fire Protection Association (NFPA).
- H. Underwriters Laboratories, Inc. (UL).

1.6 DEFINITIONS

- A. Lighting terminology used herein is defined in IES
- B. Exception: The term “driver” is used herein to cover both drivers and power supplies, where applicable.
- C. Clarification: The term “LED light source(s)” is used herein per IES to cover LED package(s), module(s), and array(s).

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be in accordance with CEC, UL, ANSI, and as shown on the drawings and specified.

2.2 LIGHTING FIXTURES (LUMINAIRES)

- A. Shall be in accordance with NFPA 70, UL 1598 and shall be as shown on drawings and as specified. All luminaires shall have been certified to the California Energy Commission by its manufacturer to comply with the efficiency standards as per California Code of Regulations Title 24, Part 6, Section 111 referencing the Appliance Efficiency Regulations in Title 20. Post certification with building permit.

- B. Sheet Metal:
 - 1. Shall be formed to prevent warping and sagging. Housing, trim and lens frame shall be true, straight (unless intentionally curved) and parallel to each other as designed.
 - 2. Wireways and fittings shall be free of burrs and sharp edges and shall accommodate internal and branch circuit wiring without damage to the wiring.
 - 3. When installed, any exposed fixture housing surface, trim frame, door frame and lens frame shall be free of light leaks; lens doors shall close in a light tight manner.
 - a. Hinged door closure frames shall operate smoothly without binding when the fixture is in the installed position, and latches shall function easily by finger action without the use of tools.
- C. Recessed fixtures shall be of the type approved for the ceiling and insulation conditions and appropriate for the installation location. Insulation must be held back from the fixture to provide manufacturers' recommended clearances for proper operation. Thermal tripping shall be the installer's responsibility to correct. Where installed in fire rated ceilings, coordinate installation of fire rated enclosures around the ceiling penetrations. Fixtures shall contain the proper through wiring capacity for that which is shown on the plans.
- D. Recessed fixtures shall be provided with the appropriate trims and hardware compatible with the ceiling type shown. Plaster frames are required where plaster or gypsum board ceilings are encountered.
- E. Fixtures with louvers or light transmitting panels shall have hinges, latches and safety catches to facilitate safe, convenient cleaning and relamping.
- F. Mechanical Safety: Lighting fixture closures (lens doors, trim frame, hinged housings, etc.) shall be retained in a secure manner by captive screws, chains, captive hinges or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.
- G. Metal Finishes:
 - 1. The manufacturer shall apply standard finish (unless otherwise specified) over a corrosion resistant primer, after cleaning to free the metal surfaces of rust, grease, dirt and other deposits. Edges of pre-finished sheet metal exposed during forming, stamping or shearing processes shall be finished in a similar corrosion resistant manner to match the adjacent surface(s). Fixture finish shall be free of stains or evidence of rusting, blistering, or flaking.
 - 2. Interior light reflecting finishes shall be white with not less than 85 percent reflectances, except where otherwise specified on the drawing.
 - 3. Exterior finishes shall be as shown on the drawings.
- H. Provide all lighting fixtures with a specific means for grounding metallic wireways and housings to an equipment grounding conductor.
- I. Light Transmitting Components for Fixtures:
 - 1. Shall be 100 percent virgin acrylic plastic or water white, annealed, crystal glass.

2. Flat lens panels shall have not less than 1/8 inch of average thickness. The average thickness shall be determined by adding the maximum thickness to the minimum unpenetrated thickness and dividing the sum by 2.
 3. Unless otherwise specified, lenses, diffusers and louvers shall be retained firmly in a metal frame by clips or clamping ring in such a manner as to allow expansion and contraction of the lens without distortion or cracking.
- J. Recessed compact LED fixtures shall be manufactured specifically for LED lamps with drivers integral to the fixture. Assemblies designed to retrofit fixtures are prohibited except when described in this fashion.

2.3 LED LUMINAIRE REQUIREMENTS

- A. General Requirements:
1. Luminaire shall have an external label per ANSI C136.15
 2. Luminaire shall have an internal label per ANSI C136.22.
 3. Luminaires shall start and operate in -20°C to +40°C ambient.
 4. LED light source(s) and driver(s) shall be RoHS compliant.

2.4 LED DRIVER

- A. Driver
1. Rated case temperature shall be suitable for operation in the luminaire operating in the ambient temperatures as indicated.
 2. Shall accept the voltage or voltage range indicated, and shall operate normally for input voltage fluctuations of plus or minus 10 percent. Consistent with NEMA SSL 1.
 3. Shall have a minimum Power Factor (PF) of 0.90 at full input power and across specified voltage range.
- B. Electromagnetic interference
1. Shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
 2. Shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
- C. The following shall be in accordance with corresponding sections of ANSI C136.37
1. Wiring and grounding
 2. All internal components shall be assembled and pre-wired using modular electrical connections.
 3. Mounting provisions
 4. Terminal blocks for incoming AC lines
 5. Latching and hinging
 6. Ingress protection

2.5 LAMPS

- A. Provide lamps for all luminaires.
- B. LED LIGHT SOURCE
 - 1. Minimum Color Rendering Index (CRI): 70.
 - 2. 4000K color temperature.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation and furnishing of lighting fixtures shall be in accordance with the CEC, manufacturer's instructions and as shown on the drawings or specified. Fixtures damaged in transit and storage prior to completion shall be replaced at Contractor's expense.
- B. Align, mount and level the lighting fixtures uniformly.
- C. Avoid interference with and provide clearance for equipment. Where the indicated locations for the lighting fixtures conflict with the locations for equipment, change the locations for the lighting fixtures by the minimum distances necessary as approved by the Architect. The Architectural reflected ceiling plan will take precedence over electrical plans.
- D. For suspended lighting fixtures, the mounting heights shall provide the clearances between the bottoms of the fixtures and the finished floors as shown on the drawings.
- E. Lighting Fixture Supports:
 - 1. Contractor shall provide support for all of the fixtures independent of suspended ceilings. Supports may be anchored to channels of the ceiling construction, to the structural slab or to structural members within a partition, or above a suspended ceiling.
 - 2. Shall maintain the fixture positions after cleaning and relamping.
 - 3. Shall support the lighting fixtures without causing the ceiling or partition to deflect.
 - 4. Hardware for recessed fluorescent fixtures:
 - 5. Fixtures shall be supported as detailed on drawings and as required by DSA standards.
 - 6. Installation: Fixtures shall be securely mounted on ceilings and walls with appropriate fastening devices. "Drop-in" type T-bar fixtures shall be secured with #12 gauge safety "earthquake wires" as described by California Code of Regulations Title 24 Part 2, Chapter 47. "Tek screws" will be required for fastening to the T-bar system in addition to safety wire. Surface mounted fluorescent fixtures shall be solidly screwed or clipped into framing above drywall with 4-#10 sheet metal screws into each fixture. Provide blocking for screw supports behind all surface mounted lighting fixtures weighing more than 15 lbs.
 - 7. Surface mounted lighting fixtures:
 - a. Fixtures shall be bolted against the ceiling independent of the outlet box at four points spaced near the corners of each unit. The bolts shall be minimum 1/4"-20 bolt,

- secured to structural ceiling. Non-turning studs may be attached to the building structure by 12 gauge safety hangers.
8. Fixtures mounted in open construction shall be secured directly to the building structure with approved bolting and clamping devices.
 9. Single or double pendent mounted lighting fixtures:
 - a. Each stem shall be supported by an approved outlet box, mounted swivel joint and canopy which holds the stem captive and provides spring load (or approved equivalent) dampening of fixture oscillations. Outlet box shall be supported vertically from the building structure and be allowed to swing to a 45 degree angle.
 10. Outlet boxes for support of lighting fixtures (where permitted) shall be secured directly to the building structure with approved devices or supported vertically in a hung ceiling from the building structure with a nine gauge wire hanger, and be secured by an approved device to a main ceiling runner or cross runner to prevent any horizontal movement relative to the ceiling.
- F. Furnish and install the specified lamps for all lighting fixtures as part of this project.
- G. Coordinate between the electrical and ceiling trades to ascertain that approved lighting fixtures are furnished in the proper sizes and installed with the proper devices (hangers, clips, trim frames, flanges), to match the ceiling system being installed.
- H. Bond lighting fixtures and metal accessories to the grounding system as specified in Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
- I. At completion of project, relamp all fixtures which have failed/burned-out lamps. Clean all fixtures, lenses, diffusers and louvers that have accumulated dust/dirt during construction.
- J. Provide unswitched leg of interior lighting branch circuit to integral emergency battery pack light fixtures, exit signs and night lights as applicable per lighting plans.
- K. Wallmount fixtures in walkway areas shall not project more than 4 inches from wall when projection occurs lower than 80 inches.

END OF SECTION 265100

SECTION 265600 – EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, and connection of exterior luminaires, controls, poles and supports.

1.2 RELATED WORK

- A. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS: Conduits, fittings, and boxes for raceway systems.
- C. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low voltage power and lighting wiring.
- D. Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- E. Section 265100, INTERIOR LIGHTING.
- F. Section 265670, LIGHTING ACCEPTANCE TESTING.

1.3 SUBMITTALS

- A. Submit in accordance with Section 26 500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Shop Drawings:
 - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - 2. Include electrical ratings, dimensions, mounting, details, materials, required clearances, terminations, wiring and connection diagrams, photometric data, ballasts, poles, luminaires, effective projected area (EPA), lamps and controls.

1.4 MAINTENANCE

- A. Provide 10 percent spare drivers for each type of lighting fixture provided or a minimum of one spare driver per each type of fixture, (whichever is greater), as loose items in manufacturers packaging to the owner. Deliver the product(s) to a location acceptable to the Owner.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM).
- C. American Concrete Institute (ACI).
- D. American National Standards Institute (ANSI).
- E. Aluminum Association Inc. (AA).
- F. Illuminating Engineering Society of North America (IESNA).
- G. National Electrical Manufacturers Association (NEMA).
- H. National Fire Protection Association (NFPA).
- I. Underwriters Laboratories, Inc. (UL).

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be in accordance with CEC, UL, ANSI, as shown on the drawings and as specified.

2.2 LUMINAIRES

- A. UL 1598 and ANSI C136.17. Luminaires shall be weatherproof, heavy duty, outdoor types designed for efficient light utilization, adequate dissipation of lamp and ballast heat and safe cleaning and relamping.
- B. Light emitting diode (LED)-based solid state lighting (SSL) products shall be factory tested in accordance to the International Engineering Society (IES) LM-79 recommendations and meet ANSI C78.377 standards.
- C. LED light sources shall be factory tested in accordance to IES LM-80 recommendations.
- D. LED-based SSL product shall incorporate an external heat sink, integral to the luminaire.
- E. IESNA HB-9 and RP-8 light distribution pattern types shall be as indicated on the drawings.

- F. Incorporate associated ballasts and drivers within the luminaire housing.
- G. Lenses shall be frame-mounted heat-resistant, borosilicate glass, prismatic refractors. Attach the frame to the luminaire housing by hinges or chain.
- H. Pre-wire internal components to terminal strips at the factory.
- I. Bracket mounted luminaires shall have leveling provisions and clamp type adjustable slip-fitters with locking screws.
- J. Materials shall be rustproof. Latches and fittings shall be non-ferrous metal.
- K. LED-based SSL luminaires shall be manufactured specifically for LED lamps with drivers integral to the luminaire housing.

2.3 LAMPS

- A. Luminaires shall be listed for the lamp specified on the associated electrical plans. Install the proper lamps in every luminaire installed.
- B. Lamps shall be clear or coated as recommended by luminaire manufacturer to provide for maximum luminaire efficiency in fixture used.

2.4 LED-BASED SOLID STATE DRIVERS

- A. Shall be listed by either U.L. or equal listing agency and comply with IEEE C.62.41-1991, Class A operation.
- B. Provide a minimum power factor of 0.9.
- C. Minimum operating temperature appropriate for outdoor environments.
- D. Shall operate at a frequency greater than or equal to 120Hz.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install lighting in accordance with the CEC, as shown on the drawings, and in accordance with manufacturer's recommendations.
- B. All lighting fixture screws and fasteners shall be stainless steel with an anti-sieze compound applied.

3.2 GROUNDING

- A. Ground noncurrent-carrying parts of equipment including metal poles, luminaries, mounting arms, brackets, and metallic enclosures as specified in Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS. Where copper grounding conductor is connected to a metal other than copper, provide specially treated or alloyed connectors suitable and listed for this purpose.

END OF SECTION 265600

SECTION 265670 - LIGHTING ACCEPTANCE TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:

1. The Contractor shall be responsible for the Certificate of Acceptance, but coordinate with the Certified California Lighting Controls Test Technician to assure that all required documents have been filed with and approved by the enforcement agency prior to receiving a final occupancy permit. The Certificate of Acceptance will indicate that the Contractor has demonstrated acceptance requirements of the plans and specifications, that current requirements for installation certificates are met, and that currently required operating and maintenance information (as well as the Certificate of Acceptance) were provided to the building Owner.
2. Testing, evaluation and calibration of lighting controls equipment provided, installed and connected in Division 26.
3. Documentation of test results, completion of "Certificate of Acceptance" and "Certificate of Installation" forms and filing with the enforcement agency for approval.
4. Specific Jobsite Conditions:
 - a. Acceptance testing must be tailored for each specific design, job site, and climactic conditions. While the steps for conducting each test remain consistent, the application of the tests to a particular site may vary. The Contractor shall review the construction documents and include all required time, material, testing equipment, etc. as required to complete the requirements of this section.

- B. Related Work:

1. Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
2. Section 265100, INTERIOR LIGHTING.
3. Section 265600, EXTERIOR LIGHTING.

1.3 REFERENCES

- A. Acceptance Testing Criteria: 2022 Building Energy Efficiency Standards Non-Residential Compliance Manual.

1.4 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. All material, equipment, labor and technical supervision to perform tests, calibrations and documentation specified herein.
- B. Scope of Testing, Evaluation and Calibration (as applicable):
 - 1. Automatic (master) time switches.
 - 2. Occupancy sensors.
 - 3. Automatic daylighting controls.
 - 4. Photo electric sensors.
 - 5. Daylighting controls.
 - 6. Outdoor astronomical time switches.
 - 7. Area controls.

1.5 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.
- B. Test Reports:
 - 1. Written record of all tests and completion of forms included in this section.
 - 2. At completion of project, assemble a final test report. Submit report to the enforcement agency and the Owner prior to final occupancy to include:
 - a. Summary of project.
 - b. Description of systems and equipment tested.
 - c. Visual inspection report.
 - d. Description of tests.
 - e. Test results.
 - f. Conclusions and recommendations.
 - 3. Report shall be bound in booklet form, include on the Contractor's letterhead the title of the report and the systems tested.
- C. Constructability Plan Review
 - 1. The Contractor shall review the construction drawings and specifications to understand the scope of the acceptance tests and raise critical issues that might affect the success of the acceptance tests prior to starting construction. Any constructability issues associated with the lighting system should be forwarded to the design team for review/modifications prior to equipment procurement and installation. The Contractor shall submit on company letterhead, with the lighting control equipment required by Section 260500, COMMON WORK RESULTS FOR ELECTRICAL, 1.4B, a letter confirming that the constructability review has been completed and their company has reviewed and is prepared to complete the lighting acceptance testing required by this section.

PART 2 - PRODUCTS

2.1 FORMS

- A. Lighting Installation forms and verification procedures for lighting systems that require acceptance testing can be downloaded from CEC website.
- B. Lighting Acceptance forms are to be provided by a Certified California Lighting Controls Acceptance Test Technician. The California Energy Commission adopted changes to the California building Efficiency Standards (Title 24, Parts 1 and 6) that require lighting controls and devices to be certified as properly installed and operational, prior to issuance of occupancy permits. All Acceptance Technicians must be employed by an Acceptance Test employer that provides support as well as quality control. Certified California Lighting Controls Acceptance Test Technicians can be found at the following website: www.calctp.org/acceptance-technicians/contractors
- C. These completed forms will be the deliverable product to the enforcement agency and Owner as described in 1.4 of this section.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Tests:
 - 1. Contractor's Responsibilities:
 - a. Perform all required tests required by this section.
 - b. Schedule testing with building Owner.
 - c. Provide Installation forms
 - d. Acceptance forms provided by California Certified Lighting Controls Technician hired by Contractor.
 - e. Calibration of equipment such as light meters, photo electric controls, etc.
 - f. Programming of time switches (interior/exterior lighting) for operations as directed by the Owner.

3.2 ADJUSTING

- A. Final Settings: The Contractor shall be responsible for implementing all final settings and adjustments on controls equipment as required for a complete and operating system.

END OF SECTION 265670

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SECTION 267700 – ASSISTIVE LISTENING SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide assisted listening systems as described herein.

1.2 SUBMITTALS

- A. Submit in accordance with Section 260500, COMMON WORK RESULTS FOR ELECTRICAL.

PART 2 - PRODUCTS

2.1 Assisted Listening Systems

- A. Provide and install complete, ADA compliant Assisted Listening Systems as follows:
 - 1. The campus shall have (as a minimum):
 - a. Portable system (Listen LS-88) consisting of a hard suitcase-style carrying case and containing a minimum of:
 - 1) (1) LT-84-01 ListenIR Transmitter/Radiator Combo
 - 2) (2) LR-4200 IR Intelligent DSP IR Receiver
 - 3) (2) LA-430 Intelligent Ear Phone/Neck Loop Lanyard
 - 4) (2) LA-401 Universal Ear Speaker
 - 5) (1) LA-277 Conference Microphone
 - 6) (1) LA-338 Table Top Tripod
 - 7) (1) LA-346 Carrying Case
 - 8) (1) LA-423 4-port USB Charger
 - b. The portable systems shall be located in an owner-approved space and be available for check out. Refer to Architectural specifications for signage requirements at classrooms, conference rooms and assembly areas.
- B. The entire system shall be of one manufacturer and shall carry a 2-year (minimum) warranty. The system shall be as manufactured by Listen Technologies or engineer approved equal.
- C. For the fixed and portable systems, the quantity of wireless headsets on-site shall satisfy the ADA requirement of 4% of the occupancy in the largest classroom, conference room and/or assembly area. Refer to architectural sheets for occupancy loads/types. For each of the fixed ALS systems, the quantity of wireless headsets and neckloops shall also satisfy the ADA requirement of 4% of the occupancy in each area where a fixed ALS is installed.

- D. In accordance with California Building Code, Assistive Listening Devices shall comply with all requirements set forth in 11B-706.
 - 1. Receivers required for use with an Assistive Listening System shall include a 1/8-inch (3.2mm) standard mono jack.
 - 2. Receivers required to be hearing-aid compatible shall interface with telecoils in hearing aids through the provision of neckloops.
 - 3. Assistive listening systems shall be capable of providing a sound pressure level of 110dB minimum and 118dB maximum with a dynamic range on the volume control of 50dB.
 - 4. The signal-to-noise ratio for internally generated noise in assistive listening systems shall be 18dB minimum.
 - 5. Peak clipping shall not exceed 18dB of clipping relative to the peaks of speech.
- E. In accordance with California Building Code, Assistive Listening Devices shall comply with all signage requirements set forth in 11B-216.10
 - 1. Each assembly area required to provide assistive listening systems (portable or fixed) shall provide signs informing patrons of the availability of the assistive listening system. The sign shall include wording that states "Assistive-Listening System Available" and shall be posted in a prominent place at or near the assembly area entrance. Assistive listening signs shall comply with California Building Code (CBC) Section 11B-703.5 and shall include the International Symbol of Access for Hearing Loss complying with CBC Section 11B-703.7.2.4.

PART 3 - EXECUTION

3.1 COMMISSIONING

- A. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, and servicing of the system. Provide a minimum of 2 hours training. Operators Manuals and Users Guides shall be provided at the time of this training.
- B. Schedule training with Owner through the Architect, with at least seven days advance notice.

END OF SECTION 267700

SECTION 271300 - INTERCOMMUNICATION SYSTEMS

PART 1 - GENERAL

1.1 Related Documents

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

1.2 Summary

A. This Section Includes:

1. Telecommunications Cabling at the buildings as part of this project. Backbone and horizontal cabling comprised of copper and fiber cabling, and support systems are covered under this document.
2. The Horizontal (workstation) Cabling System shall consist of a minimum of two (2) 4-pair Unshielded Twisted Pair (UTP) Copper Cables to each work area outlet unless otherwise noted for specific locations. The cables shall be installed from the Work Area Outlet to the existing IDF rack or cabinet and terminated as specified in this document.
3. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the contractor as detailed in this document.
4. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document. If the bid documents are in conflict, this specification shall take precedence. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

1.3 Regulatory References

- A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the local Electrical Code and present manufacturing standards.
- B. All materials shall be UL Listed and shall be marked as such. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.
- C. All modular jacks, patch cords, consolidation point, and patch cords performance shall be verified and tested by a third party to be category 6 or 6A component and channel compliant.
- D. The cabling system described in this is derived from the recommendations made in recognized telecommunications industry standards. The following documents are incorporated by reference:
 1. ANSI/TIA/EIA - 568-C.0, Generic Telecommunications Cabling for Customer Premises

2. ANSI/TIA/EIA - 568-C.1, Commercial Building Telecommunications Cabling Standard.
 3. ANSI/TIA/EIA - 568-C.2, Balanced Twisted Pair Cabling Components, Addendum 1 –
 4. ANSI/TIA/EIA - 568-C.3, Optical Fiber Cabling Components
 5. ANSI/TIA/EIA – 569-A, Commercial Building Standard for Telecommunications Pathways and Spaces.
 6. ANSI/TIA/EIA – 606-A, Administration Standard for Telecommunications Infrastructure of Commercial Buildings.
 7. ANSI/TIA/EIA – 607-A, Commercial Building Grounding and Bonding Requirements for Telecommunications.
 8. ANSI/ TIA/EIA – 758, Customer-Owned Outside Plant Telecommunications Cabling Standard.
 9. BICSI - TDMM, Building Industries Consulting Services International, Telecommunications Distribution Methods Manual (TDMM).
 10. National Fire Protection Agency (NFPA – 70), National Electrical Code (NEC) –2022.
- E. If this document and any of the documents listed above are in conflict, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.
- F. This document does not replace any code, either partially or wholly. The contractor must be aware of local codes that may impact this project.

1.4 Approved Contractor

- A. The Telecommunications Contractor must be a Certified Installer for the products and/or system being supplied. A copy of certification documents must be submitted with the quote in order for such quote to be valid. The Telecommunications contractor is responsible for workmanship and installation practices in accordance with said certification.

1.5 Work Included

- A. The work included under this specification consists of furnishing all labor, equipment, materials, and supplies and performing all operations necessary to complete the installation of this structured cabling system in compliance with the specifications and drawings. The Telecommunications contractor will provide and install all of the required material to form a complete system.
- B. The work shall include, but not be limited to the following:
1. Furnish and install a complete telecommunications wiring infrastructure as described on the plans and in these specifications.
 2. Furnish, install, and terminate all UTP and Optical Fiber cable.
 3. Furnish and install all wall plates, jacks, patch panels, and patch cords.
 4. Furnish and install all required cabinets and/or racks as required and as indicated.
 5. Furnish any other material required to form a complete system.
 6. Perform link testing (100% of horizontal and/or backbone links) and certification of all components.

7. Furnish test results of all cabling to the owner on disk and paper format, listed by each closet, then by workstation ID.
8. Adhere and comply with all requirements of the product certification programs.
9. Provide owner training and documentation. (Testing documentation and As-built drawings).

1.6 Submittals

- A. Under the provisions of this request for proposal, prior to the start of work the telecommunications contractor shall:
 1. Submit proof from manufacturer of contractor's good standing in manufacturer's program.
 2. Submit appropriate cut sheets and samples for all products, hardware and cabling.
- B. Work shall not proceed without the Owner's approval of the submitted items.
- C. The telecommunications contractor shall receive approval from the Owners on all substitutions of material. No substituted materials shall be installed except by written approval from the Owner.

1.7 Quality Assurance

- A. The telecommunications contractor shall staff the project with qualified personnel. All products shall be new and in good condition.

1.8 Delivery, Storage and Handling

- A. Delivery and receipt of products shall be at the site described in the Scope Section.
- B. Cable shall be stored according to manufacturer's recommendations as a minimum. In addition, cable must be stored in a location protected from vandalism and weather. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 40 degrees F., the cable shall be moved to a heated (50 degrees F. minimum) location. If necessary, cable shall be stored off site at the contractor's expense.

1.9 Drawings

- A. It shall be understood that the electrical details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the telecommunications contractor in bidding the job. The telecommunications contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.
- B. The telecommunications contractor shall verify all dimensions at the site and be responsible for their accuracy.

- C. Prior to submitting the bid, the telecommunications contractor shall call the attention of the Engineer to any materials or apparatus the telecommunications contractor believes to be inadequate and to any necessary items of work omitted.

PART 2 - PRODUCTS

2.1 Equivalent Products

- A. The Owner and engineer have selected specific products that achieve the desired level of performance and preference. The project has been designed around said products. Proposed substitutions must demonstrate equivalent performance in all areas to the satisfaction of the Owner and must be submitted for review at least 10 days prior to bid. The Owner shall not be required to entertain substitutions submitted after bid.

2.2 Work Area Outlets

- A. Work area cables shall each be terminated at their designated work area location in the connector types described in the subsections below. Included are modular telecommunication jacks. These connector assemblies shall snap into a faceplate.
- B. The Telecommunications Outlet Assembly shall accommodate:
 - 1. A minimum of two (2) modular jacks.
 - 2. Additional accommodations for specific locations as noted in the plans for optical fiber and/or additional copper cables as necessary.
 - 3. A blank filler will be installed when extra ports are not used.
 - 4. All modular jacks shall have their circuit number on the faceplate identifier strip.
 - 5. Multiple jacks that are identified in close proximity on the drawings (but not separated by a physical barrier) may be combined in a single assembly. The telecommunications contractor shall be responsible for determining the optimum compliant configuration based on the products proposed.
 - 6. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation. Prior to installation, the telecommunications contractor shall submit the proposed configuration for each outlet assembly for review by the Owner.
 - 7. The modular jack shall incorporate printed label strip on the dust cap module for identifying the outlet. Printed labels shall be permanent and compliant with ANSI/TIA/EIA-606-A standard specifications. Labels shall be printed using a printer such as a Brady hand held printer. Hand printed labels shall not be accepted.
- C. Faceplates: The faceplates shall:
 - 1. Be as appropriate to fit the modular jack used.
 - 2. Be UL listed and CSA certified.
 - 3. Be type 302 stainless steel.
 - 4. Shall match the faceplate color used for other utilities in the building or match the color of the raceway if installed in surface raceway.
 - 5. Be compliant with the above requirements along with the following when incorporating optical fiber:

- a. Be a low profile assembly,
 - b. Incorporate a mechanism for storage of cable and fiber slack needed for termination,
 - c. Position the fiber optic couplings to face downward or at a downward angle to prevent contamination and,
 - d. Incorporate a shroud that protects the optical couplings from impact damage.
6. Be available as single-gang or dual-gang.
 7. Provide easy access for adds, moves, and changes by front removal of jack modules.
 8. Possess recessed designation windows to facilitate labeling and identification.
 9. Include a clear plastic cover to protect labels in the designation window.
 10. Have mounting screws located under recessed designation windows.
 11. Comply with ANSI/TIA/EIA-606-A work area labeling standard.
 12. Allow for the UTP modules to be inverted in place for termination purposes.
 13. Be manufactured by an ISO 9001 registered company.

D. Data Jacks

1. Data jacks shall be 8-position modular jacks and shall be Category 6 or Category 6A (as required by each data outlet configuration shown in the plans) performance as defined by the references in this document including ANSI/TIA/EIA-568-C.2. All pair combinations must be considered, with the worst-case measurement being the basis for compliance. Modular jack performance shall be third-party verified by a nationally recognized independent testing laboratory.
2. The modular jack shall use dual reactance modular contact array.
3. The modular jack shall be both component, link and channel compliant to category specifications in ANSI/TIA/EIA-568-C.
4. The modular jack's performance shall be third-party verified to ANSI/TIA/EIA-568-C Category 6A or Category 6 (in accordance to installed cable plant) specifications.
5. The modular jack shall have low emission IDC contacts.
6. The modular jack shall use standard termination practice using 110 impact tool or other manufacturer approved method.
7. The modular jack shall be backwards compatible to Category 3, 5, 5e and 6 as applicable.
8. The modular jack shall be center tuned to Category 6A or Category 6 test specifications as applicable.
9. Dust covers shall be used on each termination.

2.3 Modular Patch Panels

A. The Modular Patch Panels shall:

1. Meet Category 6A component compliance and be verified by a third-party nationally recognized independent testing laboratory.
2. Use low emission IDC contacts.
3. Use dual reactance technology to enhance the signal-to-noise ratio.
4. Require standard termination practices using a 110 impact tool or other manufacturer approved device for modular jack termination, but panels shall be otherwise modular in nature to allow for tool-less changes to jack position within the patch panel.
5. Use a single piece IDC housing designed to accept larger Category 6A conductors.
6. Support both T568B and T568A wiring.

7. Include easy to follow wiring labels.
8. Include label fields.
9. Allow for the use of icons.
10. Include full length metal rear cable management.
11. Be available in standard or high density.
12. Be backward compatible to Category 3, 5, 5e and 6 as applicable.
13. Be center tuned to category 6 or 6A test specifications as applicable.

2.4 Horizontal Distribution Cable

- A. All horizontal data station cable shall terminate on modular patch panels (copper or fiber) or patch/splice cabinets (fiber) in their respective Telecommunications Room or Equipment Room as specified on the drawings.
- B. 100 OHM Category 6 UNSHIELDED TWISTED PAIR CABLE (UTP)
 1. Physical Characteristics:
 - a. The diameter of the insulated conductor shall be .023 in. maximum.
 - b. Shall consist of (4) twisted pairs.
 - c. Shall be suitable for the environment in which they are to be installed.
 - d. The color coding of pairs shall be in accordance with T568B:

Pair 1	Pair 2	Pair 3	Pair 4
W-BL;	BL W-O; O	W-G; G	W-BR; BR
 - e. The overall diameter of the cable shall be no larger than 0.320" nominal.
 - f. The ultimate breaking strength measured in accordance with ASTM D 4565 shall be 400 N minimum.
 - g. Cable shall withstand a bend radius of 1.2" at -20 degrees Celsius without jacket or insulation cracking.
 - h. Cable shall be third party verified to meet ANSI/TIA/EIA-568-C.2.
 2. Transmission Characteristics:
 - a. DC resistance of any conductor shall not exceed 9.38 Ohms per 100m max. at 20°C. Measured in accordance with ASTM D 4566.
 - b. The mutual capacitance of any pair at 1 kHz for 100m of cable shall not exceed 5.1 Nf.
 - c. DC resistance unbalance between any two conductors of any pair shall not exceed 3% when measured at or corrected to 20°C in accordance with ASTM D 4566.
 - d. The capacitance unbalance to ground at 1 kHz of any pair shall not exceed 330 pF per 100m.
 3. Cable shall be Berk-Tek LANmark-1000 UTP or approved equal.
 4. Cable installed underground/below slab in conduit shall be Berk-Tek LANmark series category 6 (wet location) or approved equal.
- C. 100 OHM Category 6A UNSHIELDED TWISTED PAIR CABLE (UTP)
 1. Physical Characteristics:
 - a. The diameter of the insulated conductor shall be .023 in. maximum.
 - b. Shall consist of (4) twisted pairs.
 - c. Shall be suitable for the environment in which they are to be installed.
 - d. The color coding of pairs shall be in accordance with T568B:

	Pair 1	Pair 2	Pair 3	Pair 4
	W-BL; BL	W-O; O	W-G; G	W-BR; BR
- e. The overall diameter of the cable shall be 0.320" nominal.
 - f. The ultimate breaking strength measured in accordance with ASTM D 4565 shall be 400 N minimum.
 - g. Cable shall withstand a bend radius of 1.2" at -20 degrees Celsius without jacket or insulation cracking.
 - h. Cable shall be third party verified to meet ANSI/TIA/EIA-568-C.2.
 2. Transmission Characteristics:
 - a. DC resistance of any conductor shall not exceed 9.38 Ohms per 100m max. at 20°C. Measured in accordance with ASTM D 4566.
 - b. The mutual capacitance of any pair at 1 kHz for 100m of cable shall not exceed 5.1 Nf.
 - c. DC resistance unbalance between any two conductors of any pair shall not exceed 3% when measured at or corrected to 20°C in accordance with ASTM D 4566.
 - d. The capacitance unbalance to ground at 1 kHz of any pair shall not exceed 330 pF per 100m.
 3. Cable shall be Berk-Tek LANmark-10G2 UTP or approved equal.
 4. Cable installed underground/below slab in conduit shall be Berk-Tek LANmark series category 6A (wet location) or approved equal

2.5 Patch Cords

- A. The contractor shall provide factory terminated and tested UTP and optical fiber patch cords and equipment cords for the complete cabling system. The UTP patch cables shall meet the requirements of ANSI/TIA/EIA-568-B for patch cord testing.
- B. Copper (UTP) patch cords shall:
 1. Use 8-position connector with impedance matched contacts and designed using dual reactance.
 2. Be constructed of 100 ohm, 4 pair stranded conductor, unshielded twisted pair copper per the requirements of the ANSI/TIA/EIA-568-B.2 and ANSI/TIA/EIA-568-B.2-1 standard.
 3. Meet TIA Category 6 component specifications in ANSI/TIA/EIA-568-B.2-1
 4. 100% factory tested to meet Category 6A performance and
 5. ETL or any other nationally recognized 3rd party verification
 6. Be center tuned to category 6 performance specifications by using paired bi-level contact array.
 7. Be capable of universal T568A or T568B wiring schemes.
 8. Modular connector shall maintain the paired construction of the cable to facilitate minimum untwisting of the wires.
 9. Have a performance marking indelibly labeled on the jacket (by the manufacturer).
 10. Have the ability to accept color-coded labels and icons to comply with ANSI/TIA/EIA-606-A labeling specifications.
 11. Have "snagless" protection for the locking tab to prevent snagging and to protect locking tab in tight locations and provide bend relief.
 12. Be available in three standard colors.
 13. Be available in 3 foot, 5 foot, 7 foot, 9 foot, and 15 foot standard lengths.

14. Be backwards compatible to Category 3, 5, 5e and 6.
15. Be manufactured by an ISO 9001 registered company.

2.6 Firestop

- A. A firestop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Firestop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.
- B. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly firestopped.
- C. Firestop systems shall be UL Classified to ASTM E814 (UL 1479) and shall be approved by a qualified Professional Engineer (PE), licensed (actual or reciprocal) in the state where the work is to be performed. A drawing showing the proposed firestop system, stamped/embossed by the PE shall be provided to the Owner's Technical Representative prior to installing the firestop system(s).

PART 3 - EXECUTION

3.1 Work Area Outlets

- A. Cables shall be coiled in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturer's bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. No more than 12" of UTP and 12" of fiber slack shall be stored in an in-wall box, modular furniture raceway, or insulated walls. Excess slack shall be loosely coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.
- B. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-C.0 document, manufacturer's recommendations and best industry practices.
- C. Work-area outlets shall consist of (1) true size 5 inch square recessed junction box and minimum (1) 1-1/4" raceway to accessible ceiling space. If no accessible ceiling space exists, routing shall be provided to the nearest adjacent accessible ceiling space stubbed in the direction of least distance from the serving telecommunications room (TR). Each outlet shall be capable of accommodating up to (4) modular jacks, but as few as (1). Jack counts per work area outlet shall be installed per telecommunications plans, if no count is provided on the plans, (4) jacks shall be installed (one Cat6A and three Cat6).
- D. Pair untwist at the termination shall not exceed 12 mm (one-half inch).

- E. Bend radius of the horizontal cable shall not be less than 4 times the outside diameter of the UTP cable.
- F. The cable jacket shall be maintained to within 25mm (one inch) of the termination point.
- G. Data jacks shall be identified according to district standards as outlined on drawings.
- H. There is no difference between voice and data jacks, voice cross-patching to VOIP system shall be coordinated with Owner representative.

3.2 Horizontal Distribution Cable Installation

- A. Cable shall be installed in accordance with manufacturer's recommendations and best industry practices.
- B. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
- C. Cable raceways shall not be filled greater than the ANSI/TIA/EIA-569-A maximum fill for the particular raceway type or 40%.
- D. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
- E. Where transition points, or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.
- F. The cable's minimum bend radius and maximum pulling tension shall not be exceeded.
- G. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 48 to 60 inch (1.2 to 1.5 meter) intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.
- H. Horizontal distribution cables shall be bundled in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance.
- I. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
- J. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the contractor shall install appropriate carriers to support the cabling.
- K. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.
- L. Cables shall be identified by a self-adhesive label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606-A. The cable label shall be applied to the

cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.

- M. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.
- N. Pulling tension on 4-pair UTP cables shall not exceed 25-lbf for a four-pair UTP cable.
- O. Cables installed underground or below slab shall be suitable for use in wet locations and outdoors in duct or conduit. If wet location cable is exposed in the building after exiting the wet area, it must transition to an appropriate category dry cable within 50 feet (15M) of exiting conduit.

3.3 Horizontal Copper Termination and Installation

- A. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-C standard, manufacturer's recommendations and best industry practices.
- B. Pair untwist at the termination shall not exceed 13 mm (0.5 inch).
- C. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
- D. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
- E. The cable jacket shall be maintained as close as possible (within 25mm – 1 inch) to the termination point.
- F. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.4 Backbone Cable Installation

- A. Backbone cables shall be installed separately from horizontal distribution cables
- B. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
- C. Where cables are housed in conduits, the backbone and horizontal cables shall be installed in separate conduits
- D. Where backbone cables are installed in an air return plenum, riser rated cable shall be installed in metallic conduit.
- E. Where backbone cables and distribution cables are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.

- F. All backbone cables shall be securely fastened to the sidewall of the TR on each floor.
- G. Backbone cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.
- H. Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable.
- I. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.

3.5 Firestop System

- A. All firestop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cable system acceptance.

3.6 Identification and Labeling

- A. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the successful contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme. Labeling shall follow the guidelines of ANSI/TIA/EIA-606-A.
- B. Outside Plant cables passing through a pull box or vault shall have a cable label that is water and mud proof.
- C. All label printing will be machine generated by Ortronics LabelMo, or similar software, using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

3.7 Testing and Acceptance

- A. General
 - 1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-B. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks

shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

2. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the Certification Program Information Manual provided by the product manufacturer and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

B. Copper Link Testing

1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance.
2. Horizontal cabling shall be tested using a Level III test unit for category 6 and category 6A performance compliance, corresponding with the installed cable type.
3. The basic tests required are:
 - a. Wire Map
 - b. Length
 - c. Attenuation
 - d. NEXT (Near end crosstalk)
 - e. Return Loss
 - f. ELFEXT Loss
 - g. Propagation Delay
 - h. Delay skew
 - i. PSNEXT (Power sum near-end crosstalk loss)
 - j. PSELFEXT (Power sum equal level far-end crosstalk loss)
4. Continuity - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.
5. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA/EIA-568-C Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.
6. Category 6 Performance shall meet the link requirements outlined below for a 90-meter, 4-connector permanent link.

Frequency (MHz)	Maximum Insertion Loss (dB)	Minimum NEXT (dB)	Minimum PSNEXT (dB)	Minimum ELFEXT (dB)	Minimum PSELFEXT (dB)	Minimum Return Loss (dB)
1.0	2.1	69.0	64.0	65.3	62.3	21.0
4.0	4.0	67.0	62.5	53.2	50.2	21.0
10.0	6.3	60.6	46.0	45.3	42.3	21.0
20.0	9.0	55.6	51.0	39.2	36.2	21.0
31.25	11.3	52.4	47.7	35.4	32.4	19.1
62.5	16.4	47.4	42.6	29.3	26.3	16.1
100.0	21.2	43.9	39.1	25.3	22.3	14.0
155.0	26.6	40.7	35.8	21.4	18.4	12.1
200.0	31.5	38.8	33.9	19.2	16.2	11.0
250.0	36.0	37.1	32.4	17.3	14.3	10.0

7. Category 6A performance shall meet the link requirements outlined below for a 90-meter, 4-connector permanent link.

Frequency (MHz)	Maximum Insertion Loss (dB)	Minimum NEXT (dB)	Minimum PSNEXT (dB)	Minimum ELFEXT (dB)	Minimum PSELFEXT (dB)	Minimum Return Loss (dB)
1.0	2.1	74.3	72.3	-	-	20.0
4.0	3.8	65.3	63.3	-	-	23.0
10.0	5.9	59.3	57.3	-	-	25.0
16.0	7.5	56.2	54.2	-	-	25.0
20.0	8.4	54.8	52.8	-	-	25.0
31.25	10.5	51.9	49.0	-	-	23.6
62.5	15.0	47.4	45.4	-	-	21.5
100.0	19.1	44.3	42.3	-	-	20.1
250.0	31.1	38.3	36.3	-	-	17.3
350.0	37.2	36.1	34.1	-	-	16.3
400.0	40.1	35.3	33.3	-	-	15.9
500.0	45.3	33.8	31.8	-	-	15.2

3.8 System Documentation

- A. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to the Engineer for approval. Documentation shall include the items detailed in the sub-sections below.
- B. Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g. subsystem, cable type, area, floor, etc.). This is inclusive of all test result and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer, the telecommunications contractor shall provide copies of the original test results.

- C. The Engineer may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

3.9 Test Results

- A. Test documentation shall be provided electronically within three weeks after the completion of the project. The information shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
- B. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-C including applicable TSB's and amendments. The appropriate Level III tester shall be used to verify Category 6A cabling systems.
- C. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. The telecommunications contractor must furnish this information in electronic form CD-ROM). If needed, provide manufacturers software require to read the test results.
- D. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

PART 4 - WARRANTY AND SERVICES

4.1 Warranty

- A. The manufacturer shall provide the warranty directly to the end-user.
- B. The Application Assurance Warranty shall cover the failure of the wiring system to support the applications that are designed for the link/channel specifications of ANSI/TIA/EIA-568-C.0. These applications include, but are not limited to, 10BASE-T, 100BASE-T, 1000BASE-T, 10GBASE-T, 155Mb/sATM, and 1Gb/s ATM.
- C. The contractor shall provide a warranty on the physical installation.

4.2 Final Acceptance and System Certification

- A. Completion of the installation, in-progress and final inspections, receipt of the test and as-built documentation, and successful performance of the cabling system for a two-week period will constitute acceptance of the system. Upon successful completion of the installation and subsequent inspection, the end user shall be provided with a numbered certificate, from the product manufacturer, registering the installation.

END OF SECTION 271300

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SECTION 283100 – FIRE ALARM AND DETECTION SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide a complete fully addressable, power limited, fire detection and Emergency Voice/Alarm Control (EV/ACS) system. The system shall be connected to the campus existing system, installed, tested, programmed, and verified by AHJ to be acceptable and left in first-class operating condition. All equipment herein specified shall be engineer-approved and California State Fire Marshal (CSFM) listed. The entire installation shall conform to the National Fire Protection Association (NFPA) Standard 72, 90A & CEC Article 760 and authorities having jurisdiction as applicable. The system specified and depicted on the plan is a complete and approved system. Substitution of system components or manufacturer will require the contractor to separately obtain approval with the CSFM at Contractor's expense and shall meet all requirements of the system as designed and pre-approved. The entire fire alarm system has been submitted and approved by the Division of the State Architect as a complete submittal. Any routing of the system wiring that is significantly different than shown on the approved drawings shall have the approval of the engineer and must be obtained prior to construction.
- B. Provide all work and material as shown and / or required to provide a fully functional and adequate system as specified hereon and as required by the California State Fire Marshal.
- C. Supervision: The fire alarm system shall monitor the integrity of all alarm initiating and indicating appliance circuits and provide local and remote status of all connected systems. The system shall be provided with automatically charged standby batteries to maintain system operation for 24 hours in the normal supervisory mode and 15 minutes of alarm. Batteries shall be supervised for connection to the system and low voltage threshold. The automatic battery charger shall be capable of charging fully discharged system batteries to 100% in 8 hours.
- D. The system wiring and installation shall be as stated in drawings and as required by the manufacturer. All wiring shall be color coded, tagged and verified to assure that it is free from shorts and grounds and shall be rated for the appropriate environmental conditions such as well locations.
- E. Programming: The entire system shall be programmed in accordance with manufacturers and NFPA requirements.
- F. Testing: The completed system shall be tested in accordance with NFPA Standard 72-7-1.
- G. Warranty: The equipment and wiring shall be warranted to be free from electrical and mechanical defects for a period of two (2) years commencing with final acceptance by Owner.
- H. All Fire Alarm wiring shown on drawings shall be installed in conduit.

- I. System Operation shall include:
 - 1. Separate address signaling device status indication for all initiating devices.
 - 2. The voice evacuation alarm shall sound prerecorded messages upon activation of fire alarm system. Messages to include but not limited to test, emergency and all clear. System shall be provided with a microphone for manual override of system announcements.
 - 3. Visual devices shall not exceed 2 flashes per second and shall not be slower than 1 flash per second. Visual devices shall be synchronized when 3 or more devices are within the same field of view.
 - 4. Supervision of all circuits to indicate any abnormal wiring condition.
 - 5. One (1) N.O./N.C. integral relay for external device interface or as indicated on drawings.
 - 6. Central station connection capable of indicating (3) distinct separate signals as being tamper, trouble and alarm with point reporting capabilities.
- J. All work shall be completed as shown on the plans and or as specified within this specification and shall include the following (but is not limited to):
 - 1. Life safety fire alarm detection and signaling system.
 - 2. Furnishing and installation of equipment and devices.
 - 3. Conductors, connections and interconnections where specified and all in conduit system.
 - 4. Interface with elevator controls.
 - 5. Conduit, wire and connections for control of heating and ventilation motors, smoke dampers and smoke exhaust.
 - 6. Testing, cleaning and adjusting of completed work.
 - 7. Manufacturers shop drawings specific to this project, provided by manufacturers approved contractor.
 - 8. Wiring diagrams, as-built drawings and three (3) sets of equipment operations and maintenance instructions for Owner.
 - 9. Complete maintenance for two years. Proposal for subsequent maintenance contract.
 - 10. All work and material for complete and operable systems as indicated or specified.
 - 11. Coordination with Division of State Architect (DSA) for inspections and testing.
 - 12. Identification and instruction to Owner Representative. Training shall consist of a minimum or two (2) 6-hour sessions.
 - 13. Coordination with Section 260533, RACEWAYS.
 - 14. Furnishing of special back boxes where required for installation of fire alarm devices.
- K. Mechanical system shut down addressable fire alarm relay module shall interface with fire alarm system without additional or special control devices.
- L. All conductors to be installed in conduit pursuant to Specification Section 260533, RACEWAYS.
- M. Qualifications: Contractor shall receive written approval and verified test results which shall be submitted to the owner for system from manufacturers recognized representative prior to completion and acceptance.
- N. All initiating devices shall be separately addressed for individual identification at control panel.

- O. As-Built Drawings: A complete set of "as-built" drawings (both full size hard copy and electronic version) showing installed wiring, color coding, wire tag notations exact locations of all installed equipment, specific interconnections between all equipment and internal wiring of the equipment shall be delivered to the owner upon completion of the system.
- P. Operation and Maintenance Manuals: Three (3) submittals of operations and maintenance manuals shall be provided and shall be complete, easy to read, understandable and shall provide the following information:
 - 1. Instructions for replacing any components of the system, including internal parts.
 - 2. Instructions for periodic cleaning and adjustments of equipment with a schedule of these functions.
 - 3. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.
 - 4. User operating instructions shall be prominently displayed on a separate sheet located next to the control unit in accordance with UL Standard 864. The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defects for two years from the date of final acceptance.
 - 5. Documentation cabinet shall be installed at the system control unit or as shown on the drawings. All record documentation shall be stored in the documentation cabinet. Cabinet shall be prominently labeled "System Record Documents".

1.2 SUBMITTALS

- A. Comply with applicable provisions of Section 260533, RACEWAYS.
- B. The submittal shall include certification from the manufacturer verifying that the distributor is an authorized agent, who is qualified and trained by the manufacturer in the proper installation, operation and service of the system.
- C. Shop Drawings:
 - 1. A complete list of all supplied equipment including model numbers with catalog data sheets on each component and CSFM number.
 - 2. Provide system layout, floor plan and complete drawings specific to this project, indicating location of all components and equipment, required size and location of conduit and outlets and type and quantity of system conductors. Include voltage drop calculations and battery calculations based on actual number of devices to be installed. In lieu of contractor provided shop drawings, is shall be acceptable for contractor to provide written acknowledgement that the fire alarm drawings and specifications from the approved construction documents will be used as project fire alarm shop drawings with contractor indicating no exceptions are taken.
 - 3. Include wiring diagrams for overall system and components including control panels, annunciators, power supplies, initiating circuits, notification appliances, control devices and FATC. Address numbers shall be noted on all appliances.
 - 4. Include physical and electrical characteristics of equipment to indicate conformance with the Specifications.

5. Describe system characteristics and function as well as device wiring diagrams.
 6. Voltage drop and battery calculations for each control panel and power supply and initiating circuits.
 7. System operational matrix.
- D. Data Sheets: Show California State Fire Marshal Listing, U.L. listing, equipment ratings, dimensions and finishes.
- E. Manufacturer's Certificate: Note whether the system meets or exceeds the specified requirements.
- F. Operating and Maintenance Instruction Manual:
1. Manual shall include the following tailored to this specific project:
 - a. Operational description.
 - b. Coded cabling plan.
 - c. Two wire circuit diagrams.
 - d. Wiring destination schedule.
 - e. Schematic component diagrams and PC board layouts.
 - f. Maintenance and alignment procedures.
 - g. Voltage drop and battery calculations.

1.3 COORDINATION

- A. Refer to the electrical and mechanical drawings and specifications to determine quantities and location of devices and required scope of work and coordinate work with mechanical and electrical installers. Provide function described under mechanical section Sequence of Control, for fire and/or emergency conditions. Submit proposed interconnection to mechanical contractor and elevator supplier. Submit conduit and pathing requirements to electrical installer. For self-contained door release, coordinate with door supplier.

1.4 SYSTEM DESCRIPTION

- A. General: System to be listed by Underwriters Laboratories and the California State Fire Marshal, designed to meet the functional requirements of NFPA 72A, 72B and 72D.
- B. Features:
1. Main fire control command center panel with graphic annunciator, printer and alarm communicator transmitter (DACT) where specified and/or required.
 2. (C/DACT) fire communicator shall offer three selectable reporting paths which include: Cellular only, IP only, or IP primary/cellular backup. C/DACT to connect directly to the primary and secondary communication port of the Fire Alarm Control Panel DACT. C/DACT shall deliver all signals to the central monitoring station.
 3. Remote annunciator(s) with remote microphone as specified.
 4. Alarm/trouble point transmitters.
 5. Manual alarm reporting stations (addressable).

6. Photoelectric smoke detectors (addressable).
7. Multi-criteria fire/CO detectors (addressable).
8. NAC extender panels.
9. VAC extender panel.
10. Heat detectors (addressable).
11. Electromagnetic door hold open devices as required.
12. Combination speaker/visual alarm signal devices.
13. Weatherproof speakers.
14. Visual alarm signal device.
15. Exterior bell at fire sprinkler riser.
16. Connection to sprinkler waterflow and pressure switches (addressable).
17. Sprinkler valve supervision (addressable).
18. Provision for connection to off-site central station via leased telephone lines.
19. Interface with the HVAC system for control of supply fans for all buildings. All required interface relays. Manual override control of motors and dampers at fire control panel.
20. Interface with the elevator system for elevator recall.
21. Interface with smoke fire dampers for the release of fire dampers on fire alarm initiation.
22. Beam detector and transmitter (addressable).
23. Control module (addressable).
24. Monitor module (addressable).
25. Relay module (addressable).

1.5 SYSTEM OPERATION

- A. System to be the active interrogate/respond type alarm system, 24 volt DC noncoded, positive, non-interfering, successive operation, in which all devices are constantly sending status signals to the main fire control command center from remote data transmitter panels approximately every one second. A change in status to be reported twice to determine that it is a valid signal, and be automatically and permanently recorded.
- B. Wiring, equipment and devices for alarm initiation, annunciation, and audible signaling to be continuously supervised for opens, shorts or grounds (trouble). Each alarm initiating device circuit to be provided with illuminated and audible annunciation of both trouble and alarm conditions. Non-illumination indicates a normal condition.
- C. Any alarm or trouble condition shall sound an audible signal at the fire command center and the remote annunciator. Signal shall be silenced by a momentary contact switch which shall transfer the signal to a visual indicator. Subsequent trouble conditions shall cause the signal to resound and in turn may be silenced. Upon restoration to normal, the trouble signal silencing indicator shall extinguish automatically.
- D. Activation of any automatic or manual alarm initiating device shall cause the following to occur:
 1. Sound an audible alarm and illuminate the visual indicator for zone and type of alarm at the fire command center, the remote annunciator and fire alarm control panel.

2. Sound, at building of origin, the audible alarm signal over the system audible devices and activate the visual signal devices.
 3. Transmit signal to release the electromagnetic hold open devices on corridor doors by floor.
 4. Transmit signal to close smoke dampers.
 5. Transmit alarm signal to energy management system for shutdown of building air handler (where specified).
 6. Transmit alarm signal to the central station office.
 7. Release exit door locks (where specified).
- E. System shall not incorporate a time delay for any of the alarm initiating devices. All alarms shall be considered confirmed alarms.
- F. Detection shall be addressable and reporting of fire conditions to be accomplished by the following basic methods:
1. Manual stations.
 2. Smoke detectors.
 3. CO detectors.
 4. Heat detectors.
 5. Duct detectors.
 6. Waterflow switches.
 7. Beam detectors.
 8. Smoke fire damper.
- G. Fire alarm system inputs to be further subdivided as follows, for a more defined indication of the location and nature of the fire or trouble condition:
1. Manual station by device and location.
 2. Smoke/heat detector by device and location.
 3. CO detector by device and location.
 4. Waterflow or pressure switch by device and location.
 5. Sprinkler valve position indication by device and location.
- H. Alarm condition shall override trouble indication. Trouble indication shall reappear after alarm reset.
- I. Fire Alarm initiation device address and location shall be as indicated on drawings.
- J. Printout on system printer of all alarm and trouble reports, indicating type of device, condition, time and date and alarm clearing.
- K. Selective manual testing of any device point or address in the system to determine normal, trouble or alarm status.
- L. Command center shall have annunciator indicating building floor, room number and zone.
- M. Remote annunciators and remote microphone to duplicate annunciation from the main fire alarm/voice control command center.

- N. System shall be capable of manual operation in the event of malfunction of the central processor. Supplier shall include a statement in the system shop drawing submittal explaining the manual operating capability of the system. System shall provide redundant processor capabilities to duplicate primary processor function.
- O. HVAC Interface: Coordinate system function and interface with fire alarm system for programmable shutdown of building air handlers.
- P. Operation: All components shall be interconnected in accordance with the manufacturer's instructions to provide a complete and operable system as described.

1.6 FIRE ALARM SYSTEM FUNCTIONALITY

- A. Provide a complete, electrically supervised networked addressable fire alarm and control system, with devices as specified.
- B. The system shall be a multiprocessor based control panels communicating over a peer-to-peer token ring network over fiber with a capacity of up to 64 nodes.
- C. Each node shall incorporate a fire alarm control panel with associated intergrading and signaling circuits.
- D. The control panels shall have the capability to accept firmware upgrades via laptop computer, without the requirement of replacing hardware components.
- E. The network shall be based on a peer-to-peer token ring technology operating at 625 K baud, using Style 4, 6 or 7.
- F. The network shall include the capability of using fiber-optic cables up to 200 microns.
- G. Each network node shall be capable of being programmed off-line using Windows based software supplied by manufacturer. Each node shall also be capable of being downloaded by connecting a laptop computer into any node in the system.
- H. Each network node shall be capable of being grouped with any number of additional nodes to produce a "Region", allowing that group of nodes to act as one, while retaining the peer-to-peer functionality.
- I. Each network node shall be capable of annunciating all events within its "Region" or annunciating all events from the entire network, on the front panel LCD without any additional equipment.
- J. Each network node shall be capable of having an integral digital alarm communication transmitter (DACT) that can report events in either its region, or the entire network to a single account.

- K. Each fire alarm control panel shall be capable of storing its entire program, and allow the installer to activate only the devices that are installed during construction, without further downloading of the system.
- L. Each system shall be provided with four (4) levels of password protection with up to sixteen (16) passwords.
- M. Each node shall be capable of using up to 125 "Network Groups" to allow control between different nodes.

1.7 LOADS OF EQUIPMENT AND COMPONENTS

- A. Follow IEEE Standard where applicable.
- B. Provide fuse protection for equipment and spare fuses.
- C. Operating voltage dissipated by resistors shall not exceed 25% of ratings.
- D. Operating voltage of capacitors shall not exceed 80% of rated voltage.
- E. Operating loads and voltages on transistors and solid-state devices shall not exceed manufacturer's recommendation for normal full load operation.
- F. Use electronic components of types and rating commonly available from stock of established commercial distribution.

1.8 GUARANTEE

- A. Conform to applicable provisions of the GENERAL REQUIREMENTS.
- B. Service technicians and replacement components for the system shall be available locally from a service representative of the manufacturer who is able to provide evidence of technical training and authorization by the manufacturer.
- C. For a period of two years from date of final acceptance, the system shall be under full guarantee for materials and labor at no cost to the Owner. The system shall be under a service contract with a technician authorized by the manufacturer. Replacement parts and labor shall be readily available during normal business hours while the service contract is in effect. A complete system inspection and test shall be performed at five months and again at eleven months after final acceptance. Tests shall include all smoke detector sensitivity settings.
- D. All component failures shall be remedied to the satisfaction of the Owner.
- E. A continuing service contract shall be offered at time of bid to commence at the expiration of warranty included with the system.

PART 2 - PRODUCT

2.1 MATERIALS

- A. Fire Alarm Control Panel (FACP) and system shall be UL listed for power-limited application, (as described on the plans). System shall be district standard Notifier products, no substitutions. Supplied materials shall be of the manufacturers current product line. Discontinued products are not acceptable.
- A. Addressable Devices - General
 1. Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159.
 2. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute.
 3. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.
 4. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
 5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.
 6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
 7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Bases shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications.
 8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
 9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
 10. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.

11. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.
 12. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.
 13. Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.
- B. Addressable Manual Fire Alarm Box (manual station)
1. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
 2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
 3. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.
- C. Intelligent Photoelectric Smoke Detector
1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
- D. Intelligent Laser Photo Smoke Detector
1. The intelligent laser photo smoke detector shall be a spot type detector that incorporates an extremely bright laser diode and an integral lens that focuses the light beam to a very small volume near a receiving photo sensor. The scattering of smoke particles shall activate the photo sensor.
 2. The laser detector shall have conductive plastic so that dust accumulation is reduced significantly.
 3. The intelligent laser photo detector shall have nine sensitivity levels and be sensitive to a minimum obscuration of 0.03 percent per foot.
 4. The laser detector shall not require expensive conduit, special fittings or PVC pipe.
 5. The intelligent laser photo detector shall support standard, relay, isolator and sounder detector bases.
 6. The laser photo detector shall not require other cleaning requirements than those listed in NFPA 72. Replacement, refurbishment or specialized cleaning of the detector head shall not be required.
 7. The laser photo detector shall include two bicolor LEDs that flash green in normal operation and turn on steady red in alarm.
- E. Intelligent Ionization Smoke Detector
1. The detectors shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.

- F. Intelligent Thermal Detectors
 - 1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.
- G. Intelligent Multi-Criteria Fire/CO Detector
 - 1. The detector shall have the ability to detect all four major elements of fire with a separate CO detection signal using only one address on the SLC.
 - 2. The detector shall have automatic drift compensation of smoke sensor and CO cell with CO cell end-of-life warning and fault.
- H. Addressable Dry Contact Monitor Module
 - 1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.
 - 2. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
 - 3. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.
- I. Two Wire Detector Monitor Module
 - 1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
 - 2. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
- J. Addressable Control Module
 - 1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances.
 - 2. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation.
 - 3. Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised UL listed remote power supply.
 - 4. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.
- K. Addressable Relay Module
 - 1. Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection

requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

- L. Isolator Module
 - 1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.
 - 2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
 - 3. The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
 - 4. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.
- M. Fire alarm remote (VAC) Voice Alarm Circuit power supply shall be UL Listed power limited application. Provide with (4) four-signal circuits, min. capacity or as required to make system fully operational with a minimum 50W output at 25 V_{RMS}.
- N. Fire Alarm remote (NAC) Notification Alarm Circuit power supply panel, shall be UL listed for power-limited application. Provided with (4) four-signal circuits minimum capacity or as required to make system fully operational with an output current of 6 to 9 amps as required for proper operation.
- O. System Devices and components shall be provided as specified on the fire alarm equipment legend and as shown on associated electrical drawing:
- P. Provide lockable fire alarm terminal cabinet(s) as shown on drawings or as required, size cabinets as required.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with all applicable paragraphs in Section 260500, COMMON WORK RESULTS FOR ELECTRICAL, apply as though repeated herein.
- B. Install system(s) in accordance with manufacturer's instructions.
- C. Include services of certified technicians to supervise installation, provide adjustments, provide final connections, system testing and system training to Owner Representative.

- D. The contractor shall provide a minimum of 8 hours of in-service training with this system. These sessions shall be broken into multiple segments in coordination with owner that will facilitate the training of individuals in the operation of this system. Operators Manuals and Users Guides shall be provided at the time of this training.
- E. Provide 10% overstock for all heat and smoke detectors spares as loose items in manufacturers packaging to the owner, deliver products to a location acceptable to the owner.
- F. All devices shall be labeled and have address that corresponds to final record drawings, contractor to generate an equipment labeling submittal prior to installation for owners review and approval.

3.2 GROUNDING

- A. All equipment to be grounded by means of green ground wire to "U" contact of duplex receptacles and bonded to ground provided under Division 26.

3.3 INSPECTION

- A. Systems to meet all the requirements of the CSFM and IOR and AHJ and shall be approved thereby before installation and prior to final acceptance.

3.4 LOCATION

- A. Before installation, verify exact location of control equipment and outlets. The Owner reserves the right to relocate system components within a radius of 10' at no increase in cost before rough-in work is started for the respective component.

3.5 WIRING

- A. Furnish all conductors, equipment, terminal strips, etc., and labor to install a complete and operable system. All cable conductors shall be color coded and numbered for identification at all terminals. Green shall be for grounding conductor only. Use red insulation and or red jacketing on all fire alarm cable.

3.6 TESTING

- A. After all equipment specified herein for each system has been installed and is in operating condition, conduct performance tests to determine if the installation and components comply with these specifications. Furnish competent personnel, all test material and approved test instruments and conduct the tests under supervision of factory personnel, in the presence of the Engineer, the building and fire inspecting agencies.

1. The contractor's job foreman, in the presence of a representative of the manufacturer, a representative of the owner, and the fire department shall operate every installed device to verify proper operation and correct annunciation at the control panel.
2. At least on half of all tests shall be performed on battery standby power.
3. Where application of heat would destroy any detector, it may be manually activated.
4. The signaling line circuits and notification appliance circuits shall be opened in at least two (2) locations to verify the presence of supervision.
5. When the testing has been completed to the satisfaction of the contractor representative IOR, representatives of the manufacturer and owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the owner and the authority having jurisdiction.
6. The contractor shall leave the fire alarm system in proper working order, and, without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within two years from the date of final acceptance by the awarding authority.
7. The local responding fire department must be notified prior to the final test in accordance with local requirements and when requested, participate in system testing and evaluation.

3.7 REPORT

- A. Prepare written report of final test results, signed by witnessing parties. Submit to the Engineer in triplicate for final approval.

END OF SECTION 283100

SECTION 311000 - SITE CLEARING**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Provide materials, equipment and transportation and perform labor as required for removing natural and artificial objectionable materials from the work area in advance of grading operations.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 312000: Site Grading
- B. Section 312500: Construction Storm Water Pollution Prevention

1.04 GEOTECHNICAL ENGINEERING REPORT / GEOTECHNICAL ENGINEER

- A. A geotechnical engineering report has been prepared for this project by Earth Systems Pacific, Dated October 3, 2024.
 - 1. Copies of this report and any addenda are available for review at the office of the Owner's Representative.
- B. The Geotechnical Engineer employed by the Owner to perform observation, testing and reporting during construction in accordance with the contract documents is Earth Systems Pacific. Contact number 805 544 3276

1.05 STANDARD SPECIFICATIONS

- A. Construction materials and methods shall be in accordance with the *Standard Specifications for Public Works Construction*, 2021 edition (SSPWC), published by Building News, Inc., except as modified or otherwise specified herein (hereinafter the Standard Specifications).
- B. In case of conflict between the Standard Specifications and the Project Specifications, the Project Specifications shall govern.

1.06 REFERENCE SPECIFICATIONS

- A. Construction materials and methods shall be in accordance with the site-specific recommendations contained in the Geotechnical Engineering Report(s) referenced in Paragraph 1.04 of this Section.
- B. Storm water pollution prevention materials and methods shall be in accordance with the *Stormwater Best Management Practice Handbook: Construction*, 2024 edition, published by the California Stormwater Quality Association.
- C. In case of conflict between the Standard Specifications and the Reference Specifications, the Reference Specifications shall govern.
- D. In case of conflict between the Reference Specifications and these Project Specifications, the more stringent provision shall govern, as determined by the Owner's Representative and the Engineer.

1.07 REGULATORY REQUIREMENTS

- A. Construction shall comply with the *California Code of Regulations, Title 24, Part 2 (the California Building Code)*, most recent effective edition.

1.08 JOB SITE CONDITIONS

- A. Contractor shall visit the site and shall familiarize himself with existing site conditions. Contractor shall make his own interpretations of site conditions and shall not be relieved of liability under the contract for any loss he may sustain as a result of any variance between conditions indicated by or deduced from said site visit and the actual conditions encountered during the progress of work.
- B. Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of this project including safety of all persons and property; this requirement shall apply continuously and not be limited to normal working hours.
- C. Contractor shall assume sole and complete responsibility for protection of public and private property in the vicinity of the job site and shall, at Contractor's expense, repair or replace to original condition all existing improvements within or in the vicinity of the job site which are not designated for removal and which are damaged or removed as a result of Contractor's operations.
- D. Contractor shall defend, indemnify and hold design professionals harmless from all liability and claims, real or alleged, in connection with the performance of work on this project, excepting liability arising from the sole negligence of design professionals.
- E. Existing buried pipelines and conduits known to the preparer of the Drawings are shown on the Drawings. However, all such pipelines, conduits and structures may not be shown and the locations of those shown are approximate only and have not been independently verified by the preparer of the Drawings.

1. Contractor shall independently verify or determine the presence of existing buried pipelines, conduits and structures within the work area with the utility companies, the water and sanitary agencies, and the property Owner. Before commencing work, Contractor shall determine the exact locations including depths of all existing underground pipelines, conduits and structures, including service connections, which may affect or be affected by his operations and shall mark these locations at the site with paint or flags.
 2. Contractor shall be fully responsible for any and all damages which might be occasioned by Contractor's failure to exactly locate and preserve any and all underground pipelines, conduits and structures.
 3. Upon becoming aware of existing buried pipelines, conduits or structures not shown or located differently than shown on the Drawings, Contractor shall immediately notify the Owner's Representative and the owner of the pipeline, conduit or structure by telephone and in writing. If such pipeline, conduit or structure affects or is affected by the work, Contractor shall obtain written permission and direction before proceeding with the work, excepting that in an emergency affecting safety of life, work or adjacent property, Contractor shall act at once without instructions to prevent injury or loss.
- F. Contractor shall accept the site as it exists prior to start of construction and shall do all grading work necessary to accomplish earthwork as specified herein and to the finish grades and pavement subgrades shown on or indicated by the Drawings.

1.09 EARTHWORK QUANTITIES

- A. Any earthwork quantity estimates which may be given on the Drawings are approximate only. Said estimates are based on the approximate difference between existing grades and proposed finish grades or pavement subgrades as indicated on the Drawings and do not include consideration for losses due to clearing and demolition operations, material shrinkage, consolidation and subsidence, or for landscaping improvements.
- B. Contractor shall perform an independent earthwork quantity analysis on which to base his bid. Contractor shall not be relieved of liability under the contract for any loss he may sustain as a result of any variance between earthwork estimates which may be given on the Drawings and the actual earthwork quantities required to accomplish grading as specified herein and as necessary for construction of improvements to the finish grades called for on the Drawings.

1.10 RECORD DOCUMENTS

- A. Comply with requirements of Division 1, "Project Record Documents" section, and following:

1. Accurately record location of pipelines, conduits and structures which are abandoned in place, including depth below finish grade, for Record Documents.
2. Accurately record changes in construction from that called for on the Drawings and Specifications, including unexpected physical conditions and unmarked or inaccurately marked existing pipelines, conduits and structures, for Record Documents.

1.11 QUALITY ASSURANCE

- A. A Geotechnical Engineer will be employed by the Owner to perform observation, testing and reporting during construction in accordance with the contract documents (hereinafter the Construction-Phase Geotech).
- B. Observation
 1. Clearing and grubbing operations shall be periodically observed by the Construction-Phase Geotech.
 2. Demolition operations requiring excavation more than 12 inches below existing ground surface shall be continuously observed by the Construction-Phase Geotech.
 3. All plugging of pipelines or conduits allowed to be abandoned in place outside of building and pavement areas shall be observed by the Construction-Phase Geotech.
 4. Contractor shall notify the Geotechnical Engineer, the Construction-Phase Geotech, and the Owner's Representative at least five (5) working days prior to commencement of clearing operations.
 5. The cost of observation by the Construction-Phase Geotech will be borne by the Owner.
 6. The Construction-Phase Geotech shall certify that earthwork was properly completed in conformance with the Drawings and Specifications. Certification shall be in the form of a report to the Owner's Representative.

PART 2 - MATERIALS

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PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Prior to beginning construction, perform a thorough field review of existing improvements within the jobsite; record a video of the entire site, including adjacent improvements and / or properties along the site boundary and street frontage, and provide a copy of the video to the Owners Representative for approval.
- B. Promptly notify the Owner's Representative and the agency having jurisdiction by telephone and in writing upon discovery of, and before disturbing, any physical conditions differing from those represented by approved Drawings and Specifications.
- C. Before commencing clearing or other excavation, determine the exact location of all existing underground pipelines, conduits and structures, including service connections, and mark these locations at the site with paint or flags. Maintain these location markers for the duration of construction.
- D. Section 4215.5 through 4217 of the government code of the State of California requires that, two working days prior to commencing any excavation, *Underground Service Alert of Southern California* be notified by telephone, toll free: 1-800-422-4133, for the assignment of an inquiry identification number. Before commencing clearing or other excavation, obtain the USA inquiry identification number and independently verify that each utility company or other owner of subsurface facility has located and physically marked their subsurface facilities in the area of work.
- E. Before commencing clearing or other excavation, contact each utility company or other owner of subsurface facilities and verify whether or not a representative will be present before or during excavation and determine any specific requirements for excavation in the vicinity of each subsurface facility.

3.02 CLEARING AND GRUBBING

- A. Prior to commencing grading or trenching operations, clear the existing ground surface of areas to be graded or trenched of all vegetation (except trees indicated on the Drawings to remain), whether living or dead, including roots and root structures, as well as all trash and debris, under the observation of the Construction Phase Geotech.
- B. Prior to commencing grading or trenching operations, excavate and remove from areas to be graded or trenched all existing undocumented or non-complying fill and soil containing debris, organics, pavement and other unsuitable material, as determined by the Construction Phase Geotech.
- C. If, during the removal and scarification process, excessive root structures are encountered, these areas shall be deep ripped in two directions to the depth of the root structure after which the disturbed soils and the roots shall be completely removed and the resulting

cavities shall be scarified and processed to receive fill in accordance with recommendations contained in Section 312000.

- D. Stockpile surface soils containing organic material where directed by the Owner's Representative for later use in areas to be seeded or planted; coordinate this operation so that upon completion of the project, all excess material is removed from the job site and finish grades are as called for on the Drawings and as specified herein.

3.03 DEMOLITION

- A. Where demolition activities are indicated on the Drawings or called for in the Specifications, clear old pavements, foundations, slabs, curbs, gutters, abandoned pipelines and conduits, and soils contaminated during demolition operations, as determined by the Construction Phase Geotech, except where such clearing operations may jeopardize existing trees or structures to remain ("jeopardize" with respect to a tree shall mean excavation within the dripline and with respect to a structure shall mean excavation below a line projected downward at a 2 horizontal to 1 vertical slope from a point 9 inches above the bottom of the foundation); in such case, request direction from the Owner's Representative before proceeding with the work.
- B. In addition to demolition which may be indicated on the Drawings or called for in the Specifications, make a thorough search for abandoned facilities such as septic systems, fuel or water storage tanks, and pipelines or conduits. Remove any such abandoned facilities encountered, except where such removal operations may jeopardize existing trees or structures to remain.
- C. Abandoned facilities shall not remain in place within building and pavement areas. Building area is defined as that area within, and extending a minimum of 5 feet outside of, the perimeter of the building foundation and the perimeter of steps, landings, patios, walkways and the like which are contiguous with the building. Pavement area is defined as that area within, and extending a minimum of 1 foot outside of, the limits of asphalt or concrete pavement and the limits of curb, gutter, and sidewalk contiguous with the pavement.
- D. If pipelines or conduits are allowed to be abandoned in place outside of building and pavement areas, seal all exposed openings larger than 6 inches in diameter with stiff concrete placed within the pipeline/conduit to a minimum of three (3) lineal feet beyond the opening and rodded to remove voids; provide watertight cap or plug for pipelines / conduits 6 inches or less in diameter. All such sealing operations shall be observed by the Construction-Phase Geotech.
- E. If catch basins, vaults or manhole structures are allowed to be abandoned in place outside of building and pavement areas, remove the top and walls to 24" minimum below finish grade, plug inlet and outlet openings per paragraph D above and backfill the void within the structure with 2-sack cement sand slurry, under the observation and testing of the construction phase Geotech.

3.04 TREE REMOVAL

- A. Where trees are called for to be removed, such removal shall include the stump and all roots within the original drip line to 24 inches minimum below existing or finish grade, whichever is lower, and disposal of all material off site.

3.05 BACKFILLING VOIDS

- A. Immediately replace voids or disturbed areas created during clearing and demolition operations, and which extend below the recommended overexcavation depth, with compacted fill. Do not place any fill until the underlying soil has been observed by the Construction-Phase Geotech. All fill and backfill shall be observed, tested and approved by the Construction-Phase Geotech.

3.06 CONTAMINATED SOIL

- A. If abandoned septic tanks or fuel tanks or other potential sources of contamination or hazardous waste are encountered or if soil which appears to be contaminated is encountered, immediately notify the Owner's Representative.

3.07 DUST CONTROL

- A. Contractor shall be responsible for control of dust during the entire construction period and for any damage caused by dust resulting from Contractor's operations.
- B. Employ labor, equipment and methods required to prevent construction operations from producing dust damaging to persons, property, vegetation and animals or causing a nuisance to persons occupying buildings in the vicinity of the job site. Continue dust abatement measures until authorized by the Owner's Representative to discontinue them. Contractor shall be responsible for damage caused by dust resulting from his operations.
- C. During times of earth disturbance or movement, monitor the amount of dust raised by the activity and water the areas being disturbed as needed to prevent dust from leaving the project site.
- D. Impose a speed limit of 15 miles per hour for operation of construction vehicles on unpaved or disturbed areas.
- E. Monitor the dust levels on access roads and apply water as needed to prevent dust from leaving the road areas.
- F. Ensure that trucks transporting material from the site are tarped before leaving the site with tarps sufficiently secure to remain tarped to the point of disposal.
- G. Cover stockpiled soil materials as required to prevent wind-blown dust.

3.08 NOISE CONTROL

- A. Keep noisy equipment as far as possible from the site boundaries.
- B. Install stationary equipment in enclosures.
- C. Install factory-standard silencing equipment on power-operated equipment.

3.09 EROSION AND SEDIMENTATION CONTROL

- A. Contractor shall be responsible for control of erosion and sediment transport during the entire construction period and for any damage caused by erosion or sediment transport resulting from Contractor's operations.
- B. When a Storm Water Pollution Prevention Plan (SWPPP) is included with the Drawing Set, implement and maintain erosion and sedimentation control measures in accordance with the SWPPP and Section 312500 of these Specifications.
- C. When a SWPPP is not included with the Drawing Set, develop, implement and maintain sedimentation and erosion control measures in accordance with Section 312500 of these Specifications and with the *Construction BMP Online Handbook*, January 2015 edition, available online from the California Stormwater Quality Association

3.10 TREE PROTECTION

- A. Protect existing trees and other vegetation indicated to remain in place against: unnecessary cutting, breaking or skinning of roots; skinning and bruising of bark; smothering of trees by stockpiling construction materials or excavated materials within drip line; excess foot or vehicular traffic within drip line; parking of vehicles within drip line.
- B. Provide temporary guards to protect trees and vegetation to be left standing.
- C. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
- D. Provide protection for roots over 1-1/2 inch diameter which are cut during construction operations.
 - 1. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues.
 - 2. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

- E. Employ a licensed Arborist to supervise work within the drip line of trees to remain. Replace trees which cannot be repaired and restored to full-grown status, as determined by Arborist.
- F. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Owner's Representative.
- G. Comply with Landscape Architect's tree protection requirements, if applicable.

3.11 DISPOSAL

- A. Remove from the work area, transport to a suitable location, and legally dispose of all unsuitable soil materials, rubbish, and debris resulting from clearing, demolition, and grading operations.
- B. Burning is not permitted within the work area.

END OF SECTION

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SECTION 312000 - SITE GRADING**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Provide materials, equipment and transportation and perform labor as required to complete the site grading as shown on the Drawings, specified herein or implied thereby to carry out the intent thereof.
- B. The work includes but is not limited to the following:
 - 1. All excavation to the grades shown on or indicated by the Drawings and as specified herein.
 - 2. All earth fill to the grades shown on or indicated by the Drawings and as specified herein.
 - 3. All import and export of earth material as required to accomplish the finish grades and pavement subgrades shown on or indicated by the Drawings and as specified herein.
 - 4. All conditioning, placement, compaction, and recompaction of earthwork.
 - 5. If found necessary by Construction Phase Geotech, removal and off-site disposal of unsuitable subgrade material and import, placement, and compaction of select soil or of aggregate encapsulated in geotextile, required to backfill void.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 311000: Site Clearing
- B. Section 312500: Construction Storm Water Pollution Prevention

1.04 GEOTECHNICAL ENGINEERING REPORT / GEOTECHNICAL ENGINEER

- A. The Geotechnical Engineer employed by the Owner to perform observation, testing and reporting during construction in accordance with the contract documents is Earth Systems Pacific, Telephone (805) 544-3276 (hereinafter the Construction-Phase Geotech).

1.05 STANDARD SPECIFICATIONS

- A. Construction materials and methods shall be in accordance with the *Standard Specifications for Public Works Construction*, 2021 edition (SSPWC), published by Building News, Inc., except as modified or otherwise specified herein (hereinafter the Standard Specifications).
- B. In case of conflict between the Standard Specifications and these project specifications, the project specifications shall govern.

1.06 REFERENCE SPECIFICATIONS

- A. Construction materials and methods shall be in accordance with the site-specific recommendations contained in the Geotechnical Engineering Report(s) referenced in Paragraph 1.04 of this Section.
- B. Where called for on the Drawings or in these Specifications, construction materials and methods shall be in accordance with the *Standard Specifications and Standard Plans of the State of California Department of Transportation*, most recent effective editions (CalTrans Standards). Where Metric Units of measure are used in the referenced CalTrans Standards, the equivalent English Units shall be used.
- C. Storm water pollution prevention materials and methods shall be in accordance with the *Construction BMP Online Handbook*, January 2024 edition, available online from the California Stormwater Quality Association.
- D. In case of conflict between the Standard Specifications and Reference Specifications, the Reference Specifications shall govern.
- E. In case of conflict between Reference Specifications / Details and the Project Specifications / Details, the more stringent provisions shall govern, as determined by the Owner's Representative and the Engineer.

1.07 REGULATORY REQUIREMENTS

- A. Construction shall comply with the *California Code of Regulations, Title 24, Part 2 (the California Building Code)*, most recent effective edition.
- B. Where the work site is within the unincorporated area, grading shall conform to the *San Luis Obispo Grading Ordinance*.
- C. Where the work site is within the city limits, grading shall conform with the *San Luis Obispo City Grading Code*.

1.08 SUBMITTALS

- A. Provide submittals according to the Conditions of the Contract and Division 1 "Submittal Procedures" section.
- B. Refer to "Submittal Requirements and Schedule" at the end of this section.

1.09 JOB SITE CONDITIONS

- A. Contractor shall visit the site and shall familiarize himself with existing site conditions. Contractor shall make his own interpretations of site conditions and shall not be relieved of liability under the contract for any loss he may sustain as a result of any variance between conditions indicated by or deduced from said site visit and the actual conditions encountered during the progress of work.
- B. Materials are assumed to be earth and material that can be worked with ordinary earthmoving equipment. If rock is encountered within the limits of construction, adjustments will be made in the contract in accordance with the Owner's Representative's instructions. Rock is defined as any stone or boulder that cannot be removed with power equipment without using explosives.
- C. Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of this project including safety of all persons and property; this requirement shall apply continuously and not be limited to normal working hours.
- D. Contractor shall assume sole and complete responsibility for protection of public and private property in the vicinity of the job site and shall, at Contractor's expense, repair or replace to original condition all existing improvements within or in the vicinity of the job site which are not designated for removal and which are damaged or removed as a result of Contractor's operations.
- E. Contractor shall defend, indemnify and hold design professionals harmless from all liability and claims, real or alleged, in connection with the performance of work on this project, excepting liability arising from the sole negligence of design professionals.
- F. Existing buried pipelines and conduits known to the preparer of the Drawings are shown on the Drawings. However, all such pipelines, conduits and structures may not be shown and the locations of those shown are approximate only and have not been independently verified by the preparer of the Drawings.
 - 1. Contractor shall independently verify or determine the presence of existing buried pipelines, conduits and structures within the work area with the utility companies, the water and sanitary agencies, and the property Owner. Before commencing work, Contractor shall determine the exact locations including depths of all existing underground pipelines, conduits and structures, including service connections,

which may affect or be affected by his operations and shall mark these locations at the site with paint or flags.

2. Contractor shall be fully responsible for any and all damages which might be occasioned by Contractor's failure to exactly locate and preserve any and all underground pipelines, conduits and structures.
 3. Upon becoming aware of existing buried pipelines, conduits or structures not shown or located differently than shown on the Drawings, Contractor shall immediately notify the Owner's Representative and the owner of the pipeline, conduit or structure by telephone and in writing. If such pipeline, conduit or structure affects or is affected by the work, Contractor shall obtain written permission and direction before proceeding with the work, excepting that in an emergency affecting safety of life, work or adjacent property, Contractor shall act at once without instructions to prevent injury or loss.
- G. Contractor shall accept the site as it exists prior to start of construction and shall do all grading work necessary to accomplish earthwork as specified herein and to the finish grades and pavement subgrades shown on or indicated by the Drawings.
- H. Contractor is responsible for preservation or perpetuation of all existing monuments which control subdivisions, boundaries, easements, streets, highways, or other rights-of-way, or which provide horizontal or vertical survey control which will be disturbed or removed due to Contractor's work.

1.10 EARTHWORK QUANTITIES

- A. Any earthwork quantity estimates which may be given on the Drawings are approximate only. Said estimates are based on the approximate difference between existing grades and proposed finish grades or pavement subgrades as indicated on the Drawings and do not include consideration for losses due to clearing and demolition operations, material shrinkage, consolidation and subsidence, or for landscaping improvements.
- B. Contractor shall perform an independent earthwork quantity analysis on which to base his bid. Contractor shall not be relieved of liability under the contract for any loss he may sustain as a result of any variance between earthwork estimates which may be given on the Drawings and the actual earthwork quantities required to accomplish grading as specified herein and as necessary for construction of improvements to the finish grades called for on the Drawings.

1.11 SHORING AND PROTECTION

- A. When making excavations adjacent to existing improvements or adjoining property, Contractor shall provide, install and maintain all sheeting, shoring, bracing and/or other protection necessary to prevent damage to existing improvements and failure of earth

banks. Contractor shall repair or replace to original condition, at no cost to Owner, all existing improvements which are not designated for removal and which are removed or damaged as a result of Contractor's operations.

- B. Contractor shall provide, install and maintain all sheeting, shoring, bracing and/or other protection necessary to prevent failures of temporary excavations and embankments until earthwork has been completed.
- C. Shoring, bracing and other protection, including materials and methods, shall conform with all applicable laws, ordinances, rules and regulations including all requirements of *State of California Construction and General Industry Safety Orders*, the *Occupational Safety and Health Act of 1970*, and the *Construction Safety Act*.
- D. The design and detailing of sheeting and shoring systems shall be the responsibility of the Contractor. Contractor shall submit calculations and construction details signed and sealed by a Registered Civil or Structural Engineer to the Owner's Representative prior to beginning excavation.

1.12 RECORD DOCUMENTS

- A. Comply with requirements of Division 1, "Project Record Documents" section, and following:
 - 1. Accurately record location of pipelines, conduits and structures which are abandoned in place, including depth below finish grade, for Record Documents.
 - 2. Accurately record changes in construction from that called for on the Drawings and Specifications, including unexpected physical conditions and unmarked or inaccurately marked existing pipelines, conduits and structures, for Record Documents.
 - 3. Employ a Licensed Surveyor to spot check and record finish grades for Record Documents, pursuant to Paragraph 3.17 of this Section.

1.13 QUALITY ASSURANCE

- A. A Geotechnical Engineer will be employed by the Owner to perform observation, testing and reporting during construction in accordance with the contract documents (hereinafter referred to as the Construction-Phase Geotech).
- B. Material quality and compaction testing procedures shall be in accordance with standards of the *American Society for Testing and Materials* (hereinafter referred to as "ASTM"), latest editions.

- C. The compaction standard shall be the latest adoption of the ASTM D-1557 method of compaction, or as determined by the Construction-Phase Geotech.
- D. Testing
 - 1. Tests shall be made by the Construction-Phase Geotech who shall determine the type and extent of testing necessary to assure that the earthwork was properly completed in conformance with the Drawings and Specifications.
 - 2. Cost of tests shall be paid for by the Owner. If the tests prove the work not to be in conformance with the Drawings and Specifications, the cost of additional tests shall be paid for by the Owner and backcharged to the Contractor.
- E. Observation
 - 1. Earthwork within proposed pavement and building areas shall be continuously observed and earthwork outside of building and pavement areas shall be periodically observed by the Construction-Phase Geotech to ensure compliance with the Drawings and Specifications. Contractor shall notify the Geotechnical Engineer, the Construction-Phase Geotech, and the Owner's Representative at least five (5) working days prior to commencement of grading operations.
 - 2. The cost of observation by the Construction-Phase Geotech shall be borne by the Owner.
 - 3. The Construction-Phase Geotech shall certify that earthwork was properly completed in conformance with the Drawings and Specifications. Certification shall be in the form of a report to the Owner's Representative.
- F. All import earth fill material shall be evaluated and approved by the Construction-Phase Geotech and shall be approved by the Owner's Representative prior to importing.
- G. Employ a Licensed Surveyor to lay out the work, set grade stakes, check forms, check surface of pavement base courses, and spot check and record finish grades for the Record Drawings, pursuant to Paragraph 3.17 of this Section and Section 01510 Field Engineering.

PART 2 - MATERIALS

2.01 FILL MATERIAL, GENERAL

- A. All fill soils shall be free of oversized rocks and irreducible material (over 3 inches in largest dimension), trash and debris, organics, and deleterious materials. Rocks and irreducible material no larger than 3 inches may be blended into the fill in a sufficient soil

matrix such that nesting and voids do not occur and the material can be properly compacted, under the observation of the Construction-Phase Geotech.

2.02 FILL MATERIAL, ON-SITE

- A. On-site soils free of oversize rocks and irreducible material (over 3 inches in largest dimension), trash and debris, organics and deleterious materials may be used as fill, subject to prior review and approval by the Construction Phase Geotech.
- B. On-site soils free of oversize rocks and irreducible material, trash and debris, and deleterious materials may be used as fill in areas to be landscaped, subject to prior review and approval by the Landscape Architect and the Construction Phase Geotech.
- C. Variation in organic content, expansion potential, and other characteristics of on-site soils within the expected depths of grading should be anticipated. During earthwork operations, on-site soils shall be reviewed and approved for organic content, expansion potential, and other characteristics by the construction-Phase Geotech before being used as fill under building and pavement areas.

2.03 FILL MATERIAL, IMPORT

- A. Import earth fill material shall be granular, non-expansive soils which are equal or superior in quality to the on-site soils, as determined by the Construction Phase Geotech prior to importation of the fill material to the site.
- B. Import earth fill material shall be evaluated by the Construction-Phase Geotech and shall be approved by the Owner's Representative prior to importing. Contractor shall arrange for the Construction-Phase Geotech to evaluate the proposed material at least five (5) working days prior to commencement of grading operations. The material shall also be evaluated by the Construction-Phase Geotech upon arrival at the site and intermittently during placement and compaction at the site.

2.04 SUBGRADE STABILIZATION MATERIAL

- A. Where recommended by the Construction-Phase Geotech, subgrade stabilization material shall conform to one of the following:
 - 1. Select imported fill soil having an Expansion Index of 30 or less and approved by the Construction-Phase Geotech prior to importation to the site.
 - 2. Gabion rock aggregate (thickness to be specified by Construction-Phase Geotech) imported from Bee Rock Mine, encapsulated with Mirafi 600X geotextile fabric between aggregate and subgrade soil below and Mirafi 140N geotextile fabric between aggregate and base material above.

2.05 EROSION CONTROL MATERIALS

- A. FOR SLOPES LESS THAN 5% (20H:1V):
Mulch.
- B. FOR SLOPES LESS THAN 10% (10H:1V):
Jute mesh.
- C. FOR SLOPES LESS THAN 25% (4H:1V):
North American Green S 75 straw blanket.
- D. FOR SLOPES GREATER THAN OR EQUAL TO 25% (4H:1V):
North American Green SC 150 straw / coconut blanket.
- E. FOR LINING EARTH / VEGETATED DRAINAGE SWALES:
North American Green P300 Erosion Control / Turf Reinforcement Mat.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Prior to beginning construction, perform a thorough field review of existing improvements within the jobsite; video record the entire site, including adjacent improvements and / or properties along the site boundary and street frontage, and provide a copy of the video to the Owners Representative for approval.
- B. Promptly notify the Owner's Representative and the agency having jurisdiction by telephone and in writing upon discovery of, and before disturbing, any physical conditions differing from those represented by approved Drawings and Specifications.
- C. Before commencing clearing or other excavation, determine the exact location of all existing underground pipelines, conduits and structures, including service connections, and mark these locations at the site with paint or flags. Maintain these location markers for the duration of construction.
- D. Section 4215.5 through 4217 of the government code of the State of California requires that, two working days prior to commencing any excavation, *Underground Service Alert of Southern California* be notified by telephone, toll free: 1-800-422-4133, for the assignment of an inquiry identification number. Before commencing clearing or other excavation,

obtain the USA inquiry identification number and independently verify that each utility company or other owner of subsurface facility has located and physically marked their subsurface facilities in the area of work.

- E. Before commencing clearing or other excavation, contact each utility company or other owner of subsurface facilities and verify whether or not a representative will be present before or during excavation and determine any specific requirements for excavation in the vicinity of each subsurface facility.
- F. Conduct site grading operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from Owner or authorities having jurisdiction.

3.02 SITE LAYOUT

- A. Layout work and set grade stakes as necessary to control earthwork operations such that all grading conforms to the lines and grades called for on the Drawings and as specified herein.
- B. If not dimensioned, locate finish grade elevations and features such as swales, ridge lines, etc. by scale from known points shown on the Drawings.
- C. Assume uniform gradients or vertical curves, as appropriate, between control elevations shown on the Drawings.
- D. Maintain surface drainage gradient on soil or landscaped areas at not less than 2% (1/4" per foot) unless specifically indicated otherwise on the Drawings.
- E. Maintain positive drainage away from all structures and, unless specifically indicated otherwise on the Drawings, from all slopes. Provide openings in screen walls and fences to allow uninterrupted flow of surface drainage.
- F. Plan elevations shown on soil and landscaped areas are finish grade (finish surface) elevations intended to establish surface drainage control for these areas. During grading operations, subtract thicknesses (subgrade allowances) specified by Landscape Architect for turf, wood chips, mulch, etc. from these elevations to establish finish subgrade.
- G. Plan elevations shown on walkways, ramps, steps and other hardscape are intended to establish grading and surface drainage control for these improvements. Adhere to these control elevations unless otherwise necessary for construction of these improvements in conformance with *Building Code* and *A.D.A.* requirements; perform detailed layout for and construct walkways, ramps, steps, and other hardscape in conformance with all building code and accessibility requirements, including those for dimensioning, slope, cross-slope, surface texture, warning curbs, and hand-rails.

- H. Drop-off from top of walk or flatwork edge to adjacent finish surface shall not exceed ½ inch (0.04 foot) along the edge and the finish surface cross slope shall not exceed ¼ inch per foot (2%) within 24 inches of the edge unless a 6-inch high warning curb is constructed along the edge and the edge is thickened (deepened) to 6-inches minimum below adjacent finish grade.

3.03 GRADING

- A. Perform site clearing operations per Section 311000: Site Clearing hereof.
- B. Do all rough and finish grading as necessary to bring the site to the lines and grades called for on the Drawings and as specified in this Section 312000, within the following tolerances:
 - 1. Finish subgrade soil beneath base course shall not vary more than ½ inch (0.04 foot) from the design elevation, slope and cross section, established with due allowance for thicknesses of base course and surfacing. Variations within the specified tolerance shall be compensating such that the average elevation, slope, and cross section conform to those specified per plan.
 - 2. Finish base course for pavements and for walkways, curbs, gutters, driveway aprons, and other pavement-related structures shall not vary more than ½ inch (0.04 foot) from the design elevation, slope and cross section, established with due allowance for thickness of surfacing. Variations within the specified tolerance shall be compensating such that the average elevation, slope, and cross section conform to those specified per plan.
 - 3. Finish grades in landscaped areas or other soil areas not to be surfaced shall not vary more than 1 inch (0.08 foot) above or below the design elevation and cross slope, established with due allowance for thickness of mulch or sod. Variations within the specified tolerance shall be compensating such that the average elevation, slope, and cross section conform to those specified per plan.
- C. Import fill material or remove excess material as necessary to conform to the lines and grades called for on the Drawings and as specified herein. Legally dispose of all excess excavation materials off site.

3.04 PREPARATION OF SITE FOR FILL AND SURFACE IMPROVEMENTS

- A. Strip a sufficient depth (as determined by the Construction-Phase Geotech) of surface soil from areas to receive fill to remove vegetation (except trees indicated on the Drawings to remain), roots, and other organic material and to remove loose topsoil. Stockpile this material where directed by the Owner's Representative for later use in areas to be seeded or planted. Remove and dispose of all or any remaining portion of this material when directed by the Owner's Representative or upon completion of the project.

- B. Excavate and remove all trash, debris, pavement, organic material and other unsuitable material from areas to receive fill, under the observation of the Construction-Phase Geotech.
- C. If, during the removal and scarification process, excessive root structures are encountered, deep rip these areas in two directions to the depth of the root structure, completely remove the disturbed soils and the roots, and scarify and process the resulting cavities to receive fill in accordance with the provisions of this section.
- D. Remove existing undocumented or non-complying fill and loose earth from areas to receive fill and replace depressions or disturbed areas left from removals with compacted fill, under the observation and testing of the Construction-Phase Geotech.
- E. Before placing any fill material, request review of the exposed in-place soils by, and prepare these soils to receive fill as recommended by, the Construction-Phase Geotech, including:
 - 1. Correcting any soft, overwet or pumping areas, as recommended
 - 2. Overexcavating or scarifying, moisture conditioning, and recompact as recommended and at least the upper 8 inches to at least 90% of maximum density
- F. Construct a keyway at the toe of all fill slopes which are to be constructed on natural slopes which are inclined at an angle of 5 horizontal to 1 vertical or steeper. This key shall be a minimum of 12 feet in width, shall extend a minimum of 30 inches below the original undisturbed ground surface measured at the toe of the slope, shall extend a minimum of 4 feet beyond the toe of the slope, and shall be inclined slightly into the hill. Confirm design of keyway with Construction Phase Geotech prior to constructing; the need to protect certain existing buried facilities may allow for modification to keyway dimensions.
- G. Construct benches in areas to receive fill where existing surface slope is 1 or more vertical in 5 horizontal. Confirm design of benches with Construction-Phase Geotech prior to constructing.

3.05 PLACEMENT OF FILL, GENERAL

- A. Do not place any fill material, including aggregate or sand base material, until the ground surface prepared to receive it has been reviewed and approved by the Construction-Phase Geotech and by the Owner's Representative.
- B. During fill placement, construct all contact surfaces between undisturbed original ground and compacted fill material on either horizontal or vertical planes and a minimum of 24 inches below the original undisturbed ground surface.

- C. Overbuild fill slopes and cut to finish grade to ensure specified compaction in all portions of slope face.
- D. Construct fill slopes to the configuration shown on the Drawings and at a maximum inclination of 2 horizontal to 1 vertical; compact slope faces by rolling a sheepsfoot roller or similar compaction equipment over the slope face at vertical lift intervals of 30 inches or less.
- E. Spread each layer of fill evenly and blade-mix it thoroughly during spreading to attain a relative uniformity of material within each layer.
- F. If moisture content of material is below that sufficient to achieve compaction requirements, add water to and mix the soil to attain a relatively uniform moisture content throughout the material. If moisture content is excessive, aerate the soil by blading or other methods.
- G. Place fill materials in layers that can be compacted with the equipment being used and as required by the Construction-Phase Geotechnical Engineer but not more than 6 inches in loose thickness.
- H. After each layer has been conditioned and placed, compact the material to the following densities:
 - 1. Structural Fill not otherwise specified: minimum 90% of maximum density
 - 2. Upper 12" of areas to receive landscaping but no other surface improvements: 85% of maximum density
 - 3. Sand layer and upper 6" of subgrade soil beneath sand layer in walkway areas: minimum 95% of maximum density
 - 4. Aggregate base course and upper 9" of subgrade soil beneath aggregate base course in paved areas: minimum 95% of maximum density
- I. Remove compacted fill determined by the Construction-Phase Geotech to not meet density requirements and replace and re-compact at Contractor's expense.

3.06 SPECIAL GRADING PROCEDURES UNDER BUILDING AREA

- A. These grading procedures apply to all areas beneath, and extending a minimum of 5 feet outside the exterior perimeters of, building structures including adjacent walkways, ramps, stairs, and roof cover support columns.
- B. Comply with grading procedures recommended for areas beneath the proposed structures as stipulated in the Geotechnical Engineering Report referenced in Paragraph 1.04 of this Section.

3.07 SPECIAL GRADING PROCEDURE UNDER PAVEMENT AREAS

- A. These grading procedures apply to all areas within, and extending a minimum of 1 foot outside of, the limits of asphalt or concrete pavement, the limits of curb, gutter, and sidewalk contiguous with the pavement, and the limits of site walkways, flatwork, ramps and stairs.
- B. Excavate existing soil to a depth which removes all existing non-complying fill and disturbed natural soils, as determined by the Construction-Phase Geotechnical Engineer, or to the bottom of the proposed base course, whichever is deeper.
- C. Scarify the bottom of excavations exposed pursuant to Paragraph 3.07-B above to a minimum depth of 8 inches and recompact to a minimum of 90 percent of maximum density; at least 9 inches of subgrade material below the aggregate base course in pavement areas and at least 6 inches of subgrade material below the sand course in walkway areas shall be compacted to a minimum of 95 percent of maximum density.
- D. For fill required to achieve subgrade elevations, use on-site soil or imported soil meeting the requirements for fill material per Part 2 of this Section. Condition, place, and compact this material to minimum 90% of maximum density to a level at least 9 inches below aggregate base material in pavement areas and at least 6 inches below sand layer in walkway areas. Compact remaining fill to bottom of aggregate base material or sand course to minimum 95% of maximum density.
- E. Moisten or dry scarified soil and fill material to near the optimum moisture content before compacting.
- F. For those areas where specific thicknesses of surfacing and base courses are given on the Detail Drawings, finish grading to required subgrade elevations.
- G. For those areas where estimated thicknesses of surfacing and base courses are given on the Detail Drawings, bring the areas to rough subgrade elevations based on the estimated thicknesses; request determination by the Construction-Phase Geotech of actual thickness of pavement surfacing and base courses based on the results of R-Value tests to be conducted on the rough subgrade material and the Traffic Index(es) shown on the Detail Drawings; perform additional grading if necessary to adjust subgrade elevations to accommodate the final pavement structural section thickness.
- H. Proof-roll finish subgrade with heavy, rubber-tired construction equipment under the observation of the Construction Phase Geotech; surface shall be firm and unyielding. Any areas found to be yielding under the wheel loads of the equipment shall be stabilized.

3.08 STABILIZING SUBGRADE

- A. If determined to be necessary by the Construction-Phase Geotech pursuant to Paragraph 3.04E or 3.07H above, stabilize subgrade soil by one of the following measures, subject to the approval of the Geotech:
1. Excavate to the recommended depth below the exposed in-place soil surface, remove unsuitable material, and dispose of off-site; import, place, and compact select fill soil conforming to Paragraph 2.04 above as necessary to fill the void created; all under the observation and testing of the Construction-Phase Geotech.
 2. Excavate to the recommended depth below the exposed in-place soil surface, remove unsuitable material, and dispose of off-site; import, place, and compact gabion rock aggregate encapsulated with geotextile fabric conforming to Paragraph 2.04 above between the aggregate and subgrade soil below and between the aggregate and base material above, to fill the void created; all under observation and testing of Construction-Phase Geotech.

3.09 SPECIAL REQUIREMENT FOR LANDSCAPE CONTRACTOR

- A. Landscape Contractor shall remove from the site and properly dispose of all earth spoil from plant holes and pipe trenches; excess soil and/or mulch shall not be placed or spread at the site.

3.10 EROSION CONTROL / REVEGETATION

- A. As required by storm water pollution prevention regulations, implement revegetation of each disturbed soil area within 2 weeks after completion of construction resulting in soil disturbance, unless additional disturbance will occur within 3 weeks.
- B. Where Landscaping Plans and Specifications are included with the Contract Documents, construct landscaping and irrigation in accordance therewith.
- C. Where Landscaping Plans and Specifications are not included with the Contract Documents or are included but do not address disturbed soil areas, construct hydroseeding as follows:
1. Evenly place and spread top soil stockpiled pursuant to Paragraph 3.04A above, across the disturbed area and compact to 85% of maximum density to the finish grades called for on the Drawings.
 2. Request seed mix specification from District / School, including fertilizer, mulch and stabilizer. Provide, mix, and apply hydroseeding in accordance with the supplier's instructions.

3. If District / School does not specify seed mix, provide, mix and apply hydroseeding in accordance with Section 26-3.04B of the Caltrans Standards; hydroseeding components shall be as follows:

- a. SEED MIX ONE (permanent irrigation not available):

blando brome	40%	
zorro annual fescue	8%	
lana vetch	12%	
rose clover	15%	
crimson clover	15%	
sub clover	10%	
Total	100%	applied at 350 lbs/acre

- b. SEED MIX TWO (permanent irrigation available):

Sports Turf Pro Mix available from S&S Seeds, applied at 500 lbs/acre

- c. FERTILIZER:

Gro-Power Plus, applied at 300 lbs/acre

- d. MULCH:

Wood cellulose fiber, applied at 2,000 lbs/acre

- e. STABILIZER:

Ecology Control M Binder, available from S&S, applied at 75 lbs/acre

3. Provide and install erosion control materials per Section 2.05 hereof on all disturbed areas in accordance with the manufacturer's installation guidelines.
4. Unless permanent irrigation is in place, provide manpower, materials and equipment as necessary to irrigate hydroseeded areas until plants are dense and growing, as determined by the Owner's Representative.
5. Where permanent irrigation system is in place, repair piping, valves, valve boxes, and sprinkler heads and adjust as necessary for compatibility with new finish grades and site configuration.

3.11 CONTAMINATED SOIL

- A. If abandoned septic tanks or fuel tanks or other potential sources of contamination or hazardous waste are encountered or if soil which appears to be contaminated is encountered, immediately notify the Owner's Representative.

3.12 DUST CONTROL

- A. Contractor shall be responsible for control of dust during the entire construction period and for any damage caused by dust resulting from Contractor's operations.
- B. Employ all labor, equipment and methods required to prevent construction operations from producing dust in amounts damaging to person, property, vegetation and animals or causing a nuisance to persons occupying buildings in the vicinity of the job site. Continue dust abatement measures until relief is granted by the Owner's Representative.
- C. During times of earth disturbance or movement, monitor the amount of dust raised by the activity and water the areas being disturbed as needed to prevent dust from leaving the project site and to create a crust after each day's activities cease.
- D. Impose a speed limit of 15 miles per hour for operation of construction vehicles on unpaved or disturbed areas.
- E. Monitor the dust levels on access roads and apply water as needed to prevent dust from leaving the road area.
- F. Ensure that trucks transporting material from the site are tarped before leaving the site and remain tarped to the point of disposal.
- G. Cover stockpiled soil materials to prevent wind-blown dust.

3.13 NOISE CONTROL

- A. Keep noisy equipment as far as possible from the site boundaries.
- B. Install stationary equipment in enclosures.
- C. Install factory-standard silencing equipment on power-operated equipment.

3.14 EROSION AND SEDIMENTATION CONTROL

- A. Contractor shall be responsible for storm water pollution prevention including control of erosion and sediment transport during the entire construction period and for any damage caused by pollution resulting from Contractor's operations.

- B. When a Storm Water Pollution Prevention Plan (SWPPP) is included with the Contract Documents, implement and maintain pollution prevention measures in accordance with the SWPPP and Section 312500 of these Specifications.
- C. When a SWPPP is not included with the Drawing Set, develop, implement and maintain sedimentation and erosion control measures in accordance with Section 312500 of these Specifications and with the *Construction BMP Online Handbook*, January 2015 edition, available online from the California Stormwater Quality Association

3.15 TREE PROTECTION

- A. Protect existing trees and other vegetation indicated to remain in place against: unnecessary cutting, breaking or skinning of roots; skinning and bruising of bark; smothering of trees by stockpiling construction materials or excavated materials within drip line; excess foot or vehicular traffic within drip line; parking of vehicles within drip line.
- B. Provide temporary guards to protect trees and vegetation to be left standing.
- C. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
- D. Provide protection for roots over 1-1/2 inch diameter which are cut during construction operations.
 - 1. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues.
 - 2. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
- E. Employ a licensed Arborist to supervise work within the drip line of trees to remain. Replace trees which cannot be repaired and restored to full-grown status, as determined by Arborist.
- F. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Owner's Representative.
- G. Comply with Landscape Architect's tree protection requirements, if applicable.

3.16 DISPOSAL

- A. Remove from Owner's property, transport to a suitable off-site location, and legally dispose of unsuitable and excess soil materials, rubbish, and debris resulting from clearing, demolition, and grading operations.

- B. Burning is not permitted on the Owner's property.

3.17 RECORD SURVEY

- A. Employ a Licensed Surveyor to determine by survey and to record the degree of construction conformity to design at select locations, as follows:
 - 1. Flowline elevation of earth swales and channels at 50-foot maximum spacing.
 - 2. Inclination of graded slopes at 50-foot maximum horizontal spacing.

Section continues on next page

3.18 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of this Specification Section, unless a substitute product is being proposed, in which case refer to Division 1, "Substitutions" section, for substitution requests.

Contractor's [Contractor is to acknowledge with initials each submittal included]
Initials:

_____ Letter of explanation attached for each submittal not included.

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE

- _____ 1. Submit hydro-seed component mix.
- _____ 2. Submit manufacturer's product data and recommended installation procedures for erosion control blanket.
- _____ 3. Submit shoring calculations and details as may be required pursuant to Paragraph 1.11 of this Section.
- _____ 4. Submit manufacturer's product data and recommended installation procedures for geotextile fabric for subgrade stabilization.

END OF SECTION

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SECTION 312300 - TRENCHING AND BACKFILLING**PART 1 - GENERAL****1.01 SUMMARY**

- A. Provide materials, equipment, transportation and labor as required for excavating trenches, dewatering, stabilizing trench subgrade, placing and compacting bedding material, and placing and compacting pipe zone backfill material for piped utility and storm drain piping and structures outside the exterior walls of the buildings.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 312500: Construction Storm Water Pollution Prevention
- B. Section 334100: Storm Drainage Piping
- C. Section 330000: Sanitary Sewerage Piping and Equipment
- D. Section 331000: Water Distribution Piping and Equipment

1.04 STANDARD SPECIFICATIONS

- A. Construction materials and methods shall be in accordance with the *Standard Specifications for Public Works Construction*, 2021 edition (SSPWC), published by Building News, Inc., except as modified or otherwise specified herein (hereinafter the Standard Specifications).
- B. In case of conflict between the Standard Specifications and the project specifications, the project specifications shall govern.

1.05 REFERENCE SPECIFICATIONS

- A. Construction materials and methods shall be in accordance with the site-specific recommendations contained in the Geotechnical Engineering Report(s) for this project.
- B. Storm water pollution prevention materials and methods shall be in accordance with the *Stormwater Best Management Practice Handbook: Construction*, January 2024 edition, published by the California Stormwater Quality Association.

- C. In case of conflict between the Standard Specifications and the Reference Specifications, the Reference Specifications shall govern.
- D. In case of conflict between the Reference Specifications and these project specifications, the more stringent provision shall govern, as determined by the Architect and Engineer.

1.06 REGULATORY REQUIREMENTS

- A. Construction shall comply with the *California Code of Regulations, Title 24, Part 2 (the California Building Code)*, most recent effective edition.
- B. Construction shall comply with applicable health and safety laws and standards including rules, orders and regulations of the *State of California Construction and General Industry Safety Orders*, the *Occupational Safety and Health Act of 1970*, and the *Construction Safety Act*.

1.07 SUBMITTALS

- A. Provide submittals according to the Conditions of the Contract and Division 1 "Submittal Procedures" section.
- B. Refer to "Submittal Requirements and Schedule" at the end of this Section.

1.08 JOB SITE CONDITIONS

- A. Contractor shall visit the site and shall familiarize himself with existing site conditions. Contractor shall make his own interpretations of site conditions and shall not be relieved of liability under the contract for any loss he may sustain as a result of any variance between conditions indicated by or deduced from said site visit and the actual conditions encountered during the progress of work.
- B. Materials are assumed to be earth and material that can be worked with ordinary trenching equipment. If rock is encountered within the limits of construction, adjustments will be made in the contract in accordance with the Owner's Representative's instructions. Rock is defined as any stone or boulder that cannot be removed with power equipment without using explosives.
- C. Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of this project including safety of all persons and property; this requirement shall apply continuously and not be limited to normal working hours.
- D. Contractor shall assume sole and complete responsibility for protection of public and private property in the vicinity of the job site and shall, at Contractor's expense, repair or replace to original condition all existing improvements within or in the vicinity of the job site which are not designated for removal and which are damaged or removed as a result of Contractor's operations.

- E. Contractor shall defend, indemnify and hold Design Professionals harmless from all liability and claims, real or alleged, in connection with the performance of work on this project, excepting liability arising from the sole negligence of Design Professionals.
- F. Existing buried pipelines and conduits known to the Design Professionals are shown on the Drawings. However, all such pipelines, conduits and structures may not be shown and the locations of those shown are approximate only and have not been independently verified by the preparer of the Drawings.
 - 1. Contractor shall independently verify or determine the presence of existing buried pipelines, conduits and structures within the work area with the utility companies, the water and sanitary agencies, and the property Owner. Before commencing work, Contractor shall determine the exact locations including depths of all existing underground pipelines, conduits and structures, including service connections, which may affect or be affected by his operations and shall mark these locations at the site with paint or flags.
 - 2. Contractor shall be fully responsible for any and all damages which might be occasioned by Contractor's failure to exactly locate and preserve any and all underground pipelines, conduits and structures.
 - 3. Upon becoming aware of existing buried pipelines, conduits or structures not shown or located differently than shown on the Drawings, Contractor shall immediately notify the Owner's Representative and the owner of the pipeline, conduit or structure by telephone and in writing. If such pipeline, conduit or structure affects or is affected by the work, Contractor shall obtain written permission and direction before proceeding with the work, excepting that in an emergency affecting safety of life, work or adjacent property, Contractor shall act at once without instructions to prevent injury or loss.

PART 2 - MATERIALS

2.01 BEDDING AND PIPE ZONE BACKFILL MATERIAL

- A. Unless otherwise called for on the Drawings, pipe bedding and backfill material to 12 inches minimum above top of pipe shall be imported clean sand of such particle gradation that 90 to 100 percent of the material shall pass through a No. 4 sieve, less than 5 percent shall pass through a No. 200 sieve, and the Sand Equivalent value of the material is not less than 40. For processed sand, a maximum of 15 percent shall pass through a No. 200 sieve.
- B. Bedding material used to stabilize yielding trench subgrade shall be 1/2" x No. 4 crushed rock.

2.02 TRENCH BACKFILL MATERIAL

- A. Trench backfill material from 12 inches above the top of pipe to finish grade in unpaved areas or to bottom of aggregate base material in paved areas shall be native soil, or imported soil, meeting the requirements of the Construction-Phase Geotechnical Engineer.
- B. Trench backfill material, whether native or imported shall be free of organics and deleterious material and free of lumps or stones larger than 3 inches in maximum dimension.

2.03 CONCRETE HAUNCHING AND ENCASEMENT

- A. Where called for on the Drawings, pipe bedding and/or haunching and/or backfill material shall be Portland Cement concrete conforming to Section 321613.13 hereof.

2.04 SAND / CEMENT SLURRY BACKFILL

- A. Where called for on the Drawings, material for pipe bedding / pipezone backfill (encasement), for trench backfill, or for trench plugs shall be plant-mixed sand/cement slurry containing not less than 2 sacks (188 pounds) of Type II Portland cement per cubic yard.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Promptly notify the Owner's Representative and the agency having jurisdiction by telephone and in writing upon discovery of, and before disturbing, any physical conditions differing from those represented by approved plans and specifications.
- B. Before beginning trenching, locate and expose all existing buried conduits, pipelines and structures which cross or may otherwise interfere with proposed construction. Employ a Licensed Land Surveyor to determine horizontal and vertical locations of potential obstructions, identify any conflicts with proposed construction, and provide this information to Owner's Representative for review. Allow at least five (5) working days for review.
- C. Section 4215.5 through 4217 of the government code of the State of California requires that, two working days prior to commencing any excavation, *Underground Service Alert of Southern California* be notified by telephone, toll free 1-800-422-4133, for the assignment of an inquiry identification number. Before commencing trenching, obtain the USA inquiry identification number and independently verify that each utility company or other owner of subsurface facility has located and physically marked their subsurface facilities in the area of the work.
- D. Before commencing trenching, contact each utility company or other owner of subsurface facilities and verify whether or not a representative will be present before and/or during

excavation and determine any specific requirements for excavation in the vicinity of each subsurface facility.

- E. Before beginning work, verify that excavation will not take place below a line projected downward at a 2 horizontal to 1 vertical slope from a point 9 inches above the bottom of existing or proposed structure foundations adjacent to the work; if proposed trench/foundation geometry is determined to be contrary to this requirement, request direction from Owner's Representative before proceeding with the work.
- F. Employ a Licensed Surveyor to provide line and grade control for trench excavation and backfill.
- G. Begin trenching for gravity pipelines at the lowest point of discharge and proceed in the upgrade direction.
- H. Have compaction of pipe bedding and backfill and of trench backfill tested and reported to the Owner's Representative by the Construction-Phase Geotechnical Engineer.

3.02 SAWCUTTING

For trench to be excavated in existing paved areas, construct initial sawcut line parallel with the proposed pipeline or conduit along the limits of excavation. See Subsection 3.10-B hereof for final sawcut.

3.03 TRENCH EXCAVATION

- A. Excavate trench to lines and grades indicated on the Drawings, including due allowance for thickness of bedding material.
- B. Request observation of trench subgrade condition by the Construction-Phase Geotech.

3.04 SHORING

- A. Provide, install and maintain sheeting and/or shoring systems as necessary to prevent failure of trench walls and as required by applicable laws, ordinances, rules, and regulations including those of the *State of California Construction and General Industry Safety Orders*, the *Occupational Safety and Health Act of 1970*, and the *Construction Safety Act*.
- B. Have sheeting and shoring systems designed by a Licensed Civil or Structural Engineer and submit signed and sealed calculations and construction details to the Owner's Representative prior to beginning excavation.

3.05 TRENCH PREPARATION

- A. Provide, install and operate dewatering systems as necessary to lower groundwater levels in the trench as directed by the Geotechnical Engineer. Continue dewatering until otherwise approved by the Owner's Representative.
- B. Stabilize yielding subgrade where required by the Drawings or as directed by the Geotechnical Engineer.
- C. Keep excavations free from water, whether it be from groundwater, rainfall or discharge from existing pipelines. Use pumps if necessary.
- D. Request observation of finish trench subgrade condition by the Geotechnical Engineer.
- E. Place and compact bedding material to minimum 95% of maximum density. Shape bedding material by hand to conform with bottom of pipe and fittings. Do not place bedding material before trench subgrade has been approved.

3.06 TRENCH BACKFILL AND COMPACTION

- A. After piping has been installed and assembled and has been observed and approved by the Owner's Representative, place and compact pipe zone backfill material to minimum 95% of maximum density to 12 inches above pipe in maximum 6-inch lifts. Have compaction density confirmed by testing by the Geotechnical Engineer.
- B. Place and compact trench backfill material to finish grade in unpaved areas or to the bottom of the aggregate base course in paved areas in maximum 6-inch lifts. Nesting of lumps or stones is not permitted.
- C. Trench backfill compaction shall be to not less than 90% of maximum density; the upper 12" below the aggregate base course in paved areas and the upper 6" below the base layer in walkway areas shall be to not less than 95% of maximum density. Compaction density shall be confirmed by testing and reported to the Owner's Representative by the Construction-Phase Geotechnical Engineer.
- D. Trench backfill shall not be placed until pipe zone backfill has been tested and approved.
- E. Compaction by flooding or jetting is not permitted.

3.07 SAND / CEMENT SLURRY BACKFILL

- A. Where slurry encasement is called for on the Drawings or is determined to be necessary during construction, pipe bedding and pipe zone backfill from 4 inches minimum below to 12 inches above pipe shall be sand / cement slurry conforming to Paragraph 2.04 of this Section.
- B. Pipe shall be supported on correct line and grade by concrete blocks, spaced as necessary but not to exceed 4-feet on center. Line and grade shall be confirmed by Licensed Surveyor prior to ordering slurry.

3.08 CONCRETE ENCASEMENT

- A. Where concrete encasement is called for on the Drawings or is determined to be necessary during construction, pipe bedding and pipe zone backfill from 4 inches below to 6 inches above pipe shall be concrete.
- B. Pipe shall be supported on correct line and grade by concrete blocks, spaced as necessary but not to exceed 4-feet on center. Line and grade shall be confirmed by Licensed Surveyor prior to ordering concrete.

3.09 TRENCH PLUGS

- A. Where a trench plug is called for on the Drawings or is determined to be necessary during construction, a minimum 2-foot long excavation shall be made to 12 inches minimum below the trench bottom and into each trench wall. The excavation shall be backfilled with slurry cement per Paragraph 2.04 to 12" minimum above the top of the pipe zone sand.

3.10 EROSION AND SEDIMENTATION CONTROL

- A. Contractor shall be responsible for control of erosion and sediment transport during the entire construction period and for any damage caused by erosion or sediment transport resulting from Contractor's operations.
- B. When a Storm Water Pollution Prevention and Erosion / Sediment Control Plan (SWPP / ESC Plan) is included with the Drawing Set, implement and maintain erosion and sedimentation control measures in accordance with the Plan and Section 312500 of these Specifications.
- C. When a SWPP / ESC Plan is not included with the Drawing Set, develop, implement and maintain sedimentation and erosion control measures in accordance with Section 312500 of these Specifications and with the *Construction BMP Online Handbook*, January 2015 edition, available online from the California Stormwater Quality Association.

3.11 PAVED SURFACE RESTORATION

A. NEW PAVEMENT

- 1. If trench surfacing is to be included with new pavement or reconstructed pavement, construct pavement structural section in accordance with the Drawings and Specifications.

B. PATCHED PAVEMENT

- 1. If trench surfacing is to be a patch within an existing A.C. or concrete paved surface to remain, construct as follows:

- a. Construct final sawcut lines 1-foot minimum beyond limits of trench and beyond any areas damaged by construction; final sawcut lines are in addition to those made for initial trench operations.
- b. Construct pavement structural section (thickness of aggregate base and surfacing) to match existing except where trench backfill is slurry cement which shall be carried to the bottom of A.C. or concrete surfacing.
- c. Unless waived by Owner's Representative, construct sealcoat over the full width of A.C. surfacing along the full length of the trench.
- d. Replace pavement markings and delineation in kind.

3.12 FIELD QUALITY CONTROL

- A. Request observation by Owner's Representative after installation and assembly of, but before covering, piping.
- B. Request observation and testing by the Construction-Phase Geotechnical Engineer of trench subgrade, bedding, pipe zone backfill, and trench backfill.

3.13 CONTAMINATED SOIL

- A. If abandoned septic tanks or fuel tanks or other potential sources of contamination or hazardous waste are encountered or if soil which appears to be contaminated is encountered, immediately notify the Owner's Representative.

3.14 DUST CONTROL

- A. Contractor shall be responsible for control of dust during the entire construction period and for any damage caused by dust resulting from Contractor's operations.
- B. Employ all labor, equipment and methods required to prevent construction operations from producing dust in amounts damaging to persons, property, vegetation and animals or causing a nuisance to persons occupying buildings in the vicinity of the job site. Continue dust abatement measures until relief is granted by the Owner's Representative.
- C. During times of earth disturbance or movement, monitor the amount of dust raised by the activity and water the areas being disturbed as needed to prevent dust from leaving the project site and to create a crust after each day's activities cease.
- D. Impose a speed limit of 15 miles per hour for operation of construction vehicles on unpaved or disturbed areas.
- E. Monitor the dust levels on access roads and apply water as needed to prevent dust from leaving the road access.

- F. Ensure that trucks transporting material from the site are tarped before leaving the site with tarps sufficiently secure to remain tarped to the point of disposal.
- G. Cover stockpiled soil materials as required to prevent wind-blown dust.

3.15 NOISE CONTROL

- A. Keep noisy equipment as far as possible from the site boundaries.
- B. Install stationary equipment in enclosures.
- C. Install factory-standard silencing equipment on power-operated equipment.

3.16 TREE PROTECTION

- A. Protect existing trees and other vegetation indicated to remain in place against: unnecessary cutting, breaking or skinning of roots; skinning and bruising of bark; smothering of trees by stockpiling construction materials or excavated materials within drip line; excess foot or vehicular traffic within drip line; parking of vehicles within drip line.
- B. Provide temporary guards to protect trees and vegetation to be left standing.
- C. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
- D. Provide protection for roots over 1-1/2 inch diameter cut during construction operations.
 - 1. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues.
 - 2. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
- E. Employ a Licensed Arborist to supervise work within the drip line of trees to remain.
- F. Employ a Licensed Arborist to repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Owner's Representative.

3.17 DISPOSAL

- A. Remove from the work area, transport to a suitable off-site location, and legally dispose of all unsuitable soil materials, rubbish, and debris resulting from clearing, demolition, and grading operations.
- B. Burning is not permitted within the work area.

Section continues on next page

3.18 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of this Specification Section, unless a substitute product is being proposed, in which case refer to Division 1, "Substitutions" section, for substitution requests.

Contractor's [Contractor is to acknowledge with initials each submittal included]
Initials: _____

_____ Letter of explanation attached for each submittal not included.

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE

- _____ 1. Submit sieve analyses for bedding and pipe zone backfill material.
- _____ 2. Submit Sand Equivalent analyses for bedding and pipe zone backfill material.
- _____ 3. Submit shoring calculations and details as may be required pursuant to Paragraph 3.04 of this Section.

END OF SECTION 312300

SECTION 312500 - CONSTRUCTION STORM WATER POLLUTION PREVENTION**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Provide materials, equipment and transportation and perform labor as required for installing, maintaining, repairing and, upon completion of construction, removing temporary storm water pollution prevention devices and collected pollutant material.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 311000: Site Clearing
- B. Section 312000: Site Grading

1.04 STANDARD SPECIFICATIONS

- A. Construction materials and methods shall be in accordance with the *Standard Specifications for Public Works Construction*, 2021 edition (SSPWC), published by Building News, Inc., except as modified or otherwise specified herein (hereinafter the Standard Specifications).
- B. In case of conflict between the Standard Specifications and the Project Specifications, the Project Specifications shall govern.

1.05 REFERENCE SPECIFICATIONS

- A. Where called for on the Drawings or in these Specifications, construction materials and methods shall be in accordance with *Construction BMP Online Handbook*, January 2024 edition, available online from the California Stormwater Quality Association.
- B. In case of conflict between the Standard Specifications and a reference specification, the reference specification shall govern.
- C. In case of conflict between a reference specification and these Project Specifications, the more stringent provision shall govern, as determined by the Owner's Representative and the Engineer.

1.06 REGULATORY REQUIREMENTS

- A. Construction shall comply with the *California Code of Regulations, Title 24*.
- B. Contractor shall comply with the terms of the *General Permit to Discharge Storm Water Associated with Construction Activity (WQ Order No. 99-08-DWQ)*.

1.07 SUBMITTALS

- A. Provide submittals according to the Conditions of the Contract and Division 1 "Submittal Procedures" section.
- B. Refer to "Submittal Requirements and Schedule" near the end of this Section.
- C. Prior to start of construction, execute *Contractor's Storm Water Pollution Prevention Declaration* contained at the end of this section and provide to District's Project Manager with copies to Architect and Engineer.

1.08 DOCUMENTS AT JOB SITE / RESPONSIBILITY FOR IMPLEMENTATION

- A. Maintain at the job site a set of the contract document Plan Sheets specifically for purposes of recording thereon the locations, limits, and dates of installation for the various Storm Water Pollution Prevention (SWPP) Best Management Practice Measures (BMP's), over the course of construction.
- B. Any Erosion / Sediment Control Plan or Pollution Control Site Map which may be included with the construction documents is based on the site being developed as depicted thereby when the Plan is implemented. These measures may not be suitable at all stages of construction and under all storm conditions, without modification and / or maintenance. Implementation of this Plan by Contractor shall not relieve Contractor of responsibility for construction site pollution control. Contractor shall employ all labor, equipment, materials and methods, shall make all modifications, and shall perform all maintenance necessary to prevent his / her operations from resulting in discharge of pollutants from the site.

1.09 MAINTAINING RECORDS

- A. Generate and maintain the following records and, upon request, provide copies to the Owner's Representative; at the completion of construction, deliver these records to the Owner:
 - 1. A log documenting the dates of installation, inspection, and maintenance of the various SWPP BMP's.
 - 2. Photographs with dates imprinted thereon of the SWPP BMP's taken during installation, during inspections, and after maintenance.

B. ANNUAL REPORT

1. Not Applicable.

1.10 JOB SITE CONDITIONS

- A. Contractor shall visit the site and shall familiarize himself with existing site conditions. Contractor shall make his own interpretations of site conditions and shall not be relieved of liability under the contract for any loss he may sustain as a result of any variance between conditions indicated by or deduced from said site visit and the actual conditions encountered during the progress of work.
- B. Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of this project including safety of all persons and property; this requirement shall apply continuously and not be limited to normal working hours.
- C. Contractor shall assume sole and complete responsibility for protection of public and private property in the vicinity of the job site and shall, at Contractor's expense, repair or replace to original condition all existing improvements within or in the vicinity of the job site which are not designated for removal and which are damaged or removed as a result of Contractor's operations.
- D. Contractor shall defend, indemnify and hold design professionals harmless from all liability and claims, real or alleged, in connection with the performance of work on this project, excepting liability arising from the sole negligence of design professionals.
- E. Existing buried pipelines and conduits known to the preparer of the Drawings are shown on the Drawings. However, all such pipelines, conduits and structures may not be shown and the locations of those shown are approximate only and have not been independently verified by the preparer of the Drawings.
 1. Contractor shall independently verify or determine the presence of existing buried pipelines, conduits and structures within the work area with the utility companies, the water and sanitary agencies, and the Owner. Before commencing work, Contractor shall determine the exact locations including depths of all existing underground pipelines, conduits and structures, including service connections, which may affect or be affected by his operations and shall mark these locations with paint or flags.
 2. Contractor shall be fully responsible for any and all damages which might be occasioned by Contractor's failure to exactly locate and preserve any and all underground pipelines, conduits and structures.
 3. Upon becoming aware of existing buried pipelines, conduits or structures not shown or located differently than shown on the Drawings, Contractor shall immediately notify the Owner's Representative and the owner of the pipeline,

conduit or structure by telephone and in writing. If such pipeline, conduit or structure affects or is affected by the work, Contractor shall obtain written permission and direction from the District and the owner of the pipeline, conduit or structure before proceeding with the work, excepting that in an emergency affecting safety of life, work or adjacent property, Contractor shall act at once without instructions to prevent injury or loss.

1.11 STORM WATER POLLUTION PREVENTION PLAN IMPLEMENTATION

A. *Prior to start of construction*, Contractor shall implement BMP's to address the following non-storm water issues which are related to Storm Water Pollution Prevention (SWPP). Contractor shall then maintain, monitor, and modify as necessary these same BMP measures throughout construction:

1. Material tracking off-site.
2. Equipment wash off, refueling and maintenance (if applicable).
3. Hazardous material storage (if applicable).
4. Concrete, paint, and plaster wash off / cleanup (if applicable).
5. Dewatering operations (if applicable).
6. Spill prevention and control.
7. Solid waste management.
8. Hazardous waste management.
9. Contaminated soil management.
10. Sanitary / septic waste management.
11. Liquid waste management.
12. Water conservation practices.
13. Illicit connection / discharge.
14. Potable water and irrigation water runoff / release.
15. Material delivery, storage and use.

B. *Once ground disturbance has begun*, Contractor shall implement, maintain and monitor BMP measures to address storm water related concerns for SWPP, including:

1. Wind erosion (dust) control.
 2. Street sweeping and vacuuming.
 3. Paving and grinding operations.
 4. Concrete finishing (if applicable).
 5. Silt fence and gravel bag berms when forecast of rain probability is 40% or greater.
 6. Straw bale and sandbag barrier when forecast of rain probability is 40% or greater.
 7. Storm drain inlet protection when forecast of rain probability is 40% or greater.
 8. Fiber roll berm when forecast of rain probability is 40% or greater.
 9. Temporary stream crossings or clear water diversions if water is flowing in the stream or when forecast of rain probability is 40% or greater.
 10. Stockpile management when forecast of rain probability is 40% or greater.
- C. Contractor shall implement, maintain and monitor other Best Management Practice measures (BMP's), as needed, on a case by case basis.
- D. Contractor shall adapt the BMP measures throughout the construction period as necessary to address changing site conditions, construction materials, and construction methods to prevent the discharge of pollutants from the project site.
- E. Contractor shall immediately address any deficiencies in implementation or adequacy of the BMP's identified by the Inspector or governing authority.

1.12 FINES

- A. Failure of the Contractor to properly implement Best Management Practice measures for Storm Water Pollution Prevention, may result in fines being levied against the School District (SL0USD) by the State Regional Water Quality Control Board (SRWQCB) or other governing authority.
- B. Contractor shall make full restitution to the SLCUSD for any and all fines levied against SL0USD by the SRWQCB or other local, State or Federal agencies as a result of the Contractor's failure to maintain records or to implement, maintain and monitor BMP's.

PART 2 - MATERIALS

2.01 STABILIZED CONSTRUCTION ENTRANCE

A. STEEL PLATE / ROCK ENTRANCE

1. Material for roadbed shall be crushed rock, varying between 3 inches and 6 inches in largest dimension.
2. Geotextile fabric for placement between crushed rock and soil subgrade shall be Mirafi 140N non-woven polypropylene, or equivalent approved by the Engineer, suitable for soil separation and filtration.
3. Steel plates for rumble strip shall be 8'-minimum wide by 8'-minimum long plates suitable, unsupported, for H-20 traffic loading. Plates shall be supplied with continuous transverse steel ribs at 4"-maximum spacing; ribs shall be either ½ inch minimum thick by 2 inch minimum high bars or equal-leg 3 inch by 3 inch by ½" minimum thick angles, welded to plate.

B. CRUSHED ROCK ENTRANCE

1. Material for roadbed shall be crushed rock, varying between 3 inches and 6 inches in largest dimension.
2. Geotextile fabric for placement between crushed rock and soil subgrade shall be Mirafi 140N non-woven polypropylene, or equivalent approved by the Engineer, suitable for soil separation and filtration.

C. STEEL PLATE ENTRANCE

1. Steel plate entrance is for use on existing concrete or asphalt concrete paved areas only.
2. Steel plates for rumble strip shall be 8'-minimum wide by 8'-minimum long plates suitable, unsupported, for H-20 traffic loading. Plates shall be supplied with continuous transverse steel ribs at 4"-maximum spacing; cribs shall be either ½ inch minimum thick by 2 inch minimum high bars or equal-leg 3 inch by 3 inch by ½" minimum thick angles, welded to plate.

2.02 SILT FENCE

- A. Silt fence fabric shall be a pervious sheet of synthetic polymer composed of at least 85% by weight ethylene, propylene, amide, ester, or vinylidene yarn, woven or non-woven; it shall contain stabilizers and/or inhibitors to resist deterioration by heat, water, and ultra-violet light. The fabric shall conform to the following criteria:

1. The equivalent opening size (U.S. standard sieve) shall be no larger than 70; where discharge would be to stream, lake, or wetland, E.O.S. shall be no larger than 100.
 2. The required fabric tensile strength (per A.S.T.M. D-4632) shall be 120 pounds minimum with posts installed at 4-foot spacing.
- B. Posts for supporting fence fabric shall be 3 x 3 wood or 1.33 pounds per linear foot steel with a minimum length of 42 inches. Steel posts shall have projections for attaching wire.

2.03 STRAW BALE DIKE / WEIR

- A. Straw bales shall be standard size, bound with wire or nylon.
- B. The straw bales shall be placed tightly against the ground or pavement surface and one another and shall be hand tamped firmly into place.

2.04 SILT TRAP AT DRAIN INLET

- A. Silt trap fabric shall be a pervious sheet of synthetic polymer composed of at least 85% by weight ethylene, propylene, amide, ester, or vinylidene yarn, woven or non-woven; it shall contain stabilizers and / or inhibitors to resist deterioration by heat, water, and ultraviolet light. The fabric shall conform to the following criteria:
1. The equivalent opening size (U.S. Standard sieve) shall be no larger than 70; where discharge would be to stream, lake, or wetland, E.O.S. shall be no larger than 100.
 2. The required fabric tensile strength (per A.S.T.M. D-4632) shall be 120 pounds minimum.
- B. Where called for on the drawings, common clay bricks or solid masonry blocks shall be used to hold the fabric in place.

2.05 SANDBAG BARRIER

- A. Sandbag shall be woven polypropylene, polyethylene or polyamide fabric having minimum unit weight of 4 ounces per square yard and mullen burst strength exceeding 300 pounds per square inch, in conformance with the requirements of ASTM Designation D3786, and having ultraviolet stability exceeding 70%, in conformance with the requirements of ASTM Designation D4355.
- B. Each sand-filled bag should have a length of 18 inches, width of 12 inches, thickness of 3 inches, and mass of approximately 33 pounds. Bag dimensions are nominal.

- C. All sandbag fill material shall consist of natural or manufactured granular material, or a combination thereof.

2.06 GRAVEL BAG FILTER

- A. Gravel bags shall be woven polypropylene, polyethylene or polyamide fabric having minimum unit weight of 4 ounces per square yard and mullen burst strength exceeding 300 pounds per square inch, in conformance with the requirements of ASTM designation D3786, and having stability exceeding 70%, in conformance with the requirements of ASTM designation D4355.
- B. Each gravel-filled bag should have a length of 18 inches, width of 12 inches, thickness of 3 inches and mass of approximately 33 pounds. Bag dimensions are nominal.
- C. Gravel bag filled material should be 0.5 to 1 inch, clean crushed rock, free from clay, organic matter, and other deleterious materials.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Contractor shall implement NPDES Permit Requirements including:
 - 1. Reviewing the Storm Water Pollution Prevention Plan (SWPPP).
 - 2. Amending the SWPPP to address changes in site conditions, construction materials, or construction operations that may affect the discharge of pollutants from the site.
 - 3. Holding a mandatory training seminar with the general contractor's personnel, subcontractors' personnel, and material suppliers' personnel to explain the job requirements related to Storm Water Pollution Prevention; requiring those that attend to sign a training log indicating that they have attended the seminar and that they agree to implement and maintain the BMP's throughout construction.
 - 4. Conducting weekly inspection and maintenance of the in-place BMP's.
 - 5. Conducting inspections of the BMP's before each anticipated storm event and after each actual storm event; making the necessary repairs or modifications at the time of the inspection.
 - 6. Ensuring full compliance with the Permit and implementing all elements of the Storm Water Pollution Prevention Plan, including elimination of all unauthorized discharges and preparation of an annual compliance evaluation.

- B. The location and extent of the various BMP's shall be reviewed at the site by the DSA inspector at the beginning of the installation process. Provide 24 hours minimum notice.
- C. The locations of the various BMP's may require adjustment due to changing site conditions and additional installations may be required by the inspector.
- D. All BMP's shall be inspected and repaired at the end of each work week and, in addition, before and after each storm.
- E. Pollutant deposits shall be removed from BMP's after each storm to restore their capacity. Soil material shall be stockpiled such that it cannot again result in sediment transport on- or off-site; other pollutants collected shall be removed from the site and disposed of in a proper and legal manner.
- F. During the rainy season, the site shall be maintained such that no sediment or other pollutant-laden runoff enters the storm drainage system or flows offsite.
- G. A standby crew shall be provided by the contractor for emergency work during rainstorms and shall remain onsite as needed to maintain BMP's during periods of precipitation.

3.02 STABILIZED CONSTRUCTION ENTRANCE

A. STEEL PLATE / ROCK ENTRANCE

1. Clear the existing ground surface of vegetation and debris and grade the roadbed and immediately downstream of the roadbed to provide positive and controlled drainage in accordance with the plan detail.
2. Place crushed rock over filter fabric.
3. Place steel plates.

B. CRUSHED ROCK ENTRANCE

1. Clear the existing ground surface of vegetation and debris and grade the roadbed and immediately downstream of the roadbed to provide positive and controlled drainage in accordance with the plan detail.
2. Place crushed rock over filter fabric.

C. STEEL PLATE ENTRANCE

1. Sweep clean the existing pavement surface beneath, to either side and immediately upstream and downstream prior to placing steel plates.

2. Place steel plates on top of the existing pavement, paying attention to prevent damage to the existing pavement and where applicable near by existing curbs, walls, etc.
3. Construct cold-mix A.C. conform patches to hold plates in place.

D. MAINTENANCE

1. Require that all employees, subcontractors, and suppliers utilize the stabilized construction entrance.
2. Inspect routinely to verify that steel plates have not moved out of place and that plate or crushed rock is not encroaching into sidewalk or other public right-of-way.
3. Remove soil collected between plate ribs and rock voids as necessary to prevent clogging, at least once a week, and prior to any storm event.
4. For Crushed Rock Entrance: remove, clean and replace rock or reconstruct as necessary to maintain effectiveness of entrance for removing soil from vehicles.
5. Inspect stabilized construction entrance daily and sweep tracked sediment as needed.

3.03 EROSION AND SEDIMENT CONTROL

A. GENERAL

1. Any Erosion / Sediment Control Plan which may be included with the construction documents is based on the site being developed as depicted thereby when the Plan is implemented. These measures may not be suitable at all stages of construction and under all storm conditions, without modification and / or maintenance. Implementation of this Plan by Contractor shall not relieve Contractor of responsibility for construction site erosion control measures. Contractor shall employ all labor, equipment, materials and methods necessary to prevent his / her operations from resulting in discharge from the site of silt (mud) and / or debris.
2. Erosion / sediment control measures shall be in place at anytime during the year when the forecast of rain probability is 40% or greater, for each year, until the site improvements, including grading, paving, drainage devices, and landscaping, have been constructed. Erosion / sediment control measures shall be inspected and repaired as necessary each week and before and after each storm.
3. The location and extent of erosion control measures shall be reviewed at the site by the inspector at the beginning of the installation process. Provide 24 hours minimum notice.

4. The locations of swales, erosion / sediment control berms, barriers, and silt fences may require adjustment due to changing site conditions and additional installations may be required by the inspector.
5. During the rainy season, all erosion / sediment control measures shall be inspected and repaired each week and before and after each storm.
6. Soil and debris deposits shall be removed from erosion control swales and from behind erosion / sediment control berms, barriers, and silt fences after each storm to restore their capacity. The spoil material shall be stockpiled such that it cannot again result in sediment transport on or off-site.
7. During the rainy season, all paved areas shall be kept clear of soil material and debris. The site shall be maintained such that no sediment-laden runoff enters the storm drainage system or sheet-flows offsite.
8. A standby crew shall be provided by the contractor for emergency work during rainstorms and shall remain onsite as needed to maintain BMP's during periods of precipitation.

B. SILT FENCE

1. The height of silt fence shall not exceed 24 inches above grade. On slopes, the fence line shall follow an elevation contour as closely as possible. Where crossing small swales, the fence line shall be curved upstream on each side to direct the flow towards the middle of the fence arc.
2. If possible, the filter fabric shall be cut from a continuous roll to avoid the use of joints. When joints are necessary, filter cloth shall be spliced only at a support post, with a minimum 6-inch overlap, with both ends securely fastened to the post.
3. Posts shall be spaced a maximum of 4 feet apart and be driven securely into the ground to a minimum depth of 12 inches. Subject to inspector's acceptance, chain link construction or permanent fencing may be used to support fabric in lieu of silt fence posts.
4. A trench shall be excavated approximately 6 inches in width and 6 inches in depth along the line of posts on the upslope side of the barrier.
5. Filter fabric shall be stapled or wired to the fence, and 12 inches of the fabric shall extend into the trench. The fabric shall not extend more than 24 inches above the original ground surface. Filter fabric shall not be stapled to existing trees.
6. The location of silt fencing may require adjustment due to changing site conditions and additional installations may be required by the DSA inspector.

C. STRAW BALE DIKE / WEIR

1. Bales shall be placed in a row or as shown on the plan with ends tightly abutting.
2. Each bale shall be embedded in the soil a minimum of 4 inches.
3. Bales shall be securely anchored in place by two stakes driven through the bales. The first stake in each bale shall be driven toward the previously laid bale to force bales together.
4. The locations of straw bale dikes / weirs may require adjustments due to changing site conditions and additional installations may be required by the DSA inspector.

D. SILT TRAP AT DRAIN INLET

1. For larger inlets having steel or cast iron grates, the fabric shall be installed between the frame and grate and then the grate reseated to secure the fabric in place. The fabric panel used to cover the inlet shall be a minimum of 12" larger in square dimension or in diameter than the grate.
2. For smaller inlets, the fabric shall be centered over the in-place grate and held down with bricks or solid masonry blocks. The fabric panel size used to cover the inlet shall be a minimum of 24" square or in diameter.
3. The filter fabric shall be cut from a continuous roll, as no joints will be allowed.

E. SANDBAG BARRIER

1. The height of the sandbag barrier shall be approximately 6", or two bags.
2. The sandbags shall be placed tightly against the ground or pavement surface and one another and shall be hand tamped into place.

F. GRAVEL BAG FILTER

1. The height of the gravel bag filter shall be approximately 3", or one bag.
2. The gravel bags shall be placed tightly against the ground or pavement surface and one another and shall be hand tamped into place.

G. MAINTENANCE

1. SILT FENCE

- a. Silt fences shall be inspected each week, before a storm, periodically during rainfall, and after each storm. Any required repairs shall be made immediately.
- b. Should the fabric on a silt fence decompose or become ineffective during the time the fence or barrier is still necessary, the fabric shall be replaced immediately.
- c. Sediment deposits (spoils) shall be removed when depth of deposits reach approximately one-half the height of the silt fence (12-inches maximum) and after each storm. Sediment buildups must be removed when bulges develop in the fence regardless of depth of deposition.

2. STRAW BALE DIKES / WEIRS

- a. Straw bale dikes / weirs shall be inspected each week, before a storm, periodically during rainfall, and after each storm. Any required repairs shall be made immediately.
- b. Should the straw bales decompose or become ineffective during the time the devices are still necessary, they shall be replaced immediately.
- c. Sediment deposits shall be removed when deposits reach approximately one-half the height of the dike / weir.

3. SILT TRAPS AT DRAIN INLET

- a. Silt traps shall be inspected each week, before a storm, periodically during rainfall, and after each storm. Any required maintenance or repair shall be made immediately.
- b. Sediment deposits (spoil) and other debris trapped on the fabric shall be removed as necessary during rainfall to maintain inflow to the drain inlet.
- c. Should the silt trap fabric decompose or become ineffective during the time the devices are still necessary, it shall be replaced immediately.

4. SANDBAG BARRIER

- a. Sandbag barrier shall be inspected each week, before a storm, periodically during rainfall, and after each storm. Any required repairs shall be made immediately.
- b. Should the fabric of the sandbag decompose during the time the barrier is still necessary, the sandbag shall be removed and replaced immediately.

Sandbags exposed to sunlight will need to be replaced every two to three months.

- c. Washouts or other damage shall be repaired immediately.
- d. Sediment and debris that accumulate behind the sandbag barrier must be periodically removed in order to maintain the barrier effectiveness. Materials should be removed when the accumulation reaches one third of the barrier height.

5. GRAVEL BAG FILTERS

- a. Gravel bag filters shall be inspected each week, before storm, periodically during rainfall, and after each storm. Any required repairs shall be made immediately.
- b. Should the fabric of the gravel bag decompose during the time the filter is still necessary, the gravel bag shall be removed and replaced immediately. Gravel bags exposed to sunlight will need to be replaced every two to three months.
- c. Washouts or other damage shall be repaired immediately.
- d. Sediment and debris that accumulates behind the gravel bag filter must be periodically removed in order to maintain the filter effectiveness. Material should be removed when the accumulation reaches one third of the filter height.

- 6. Spoil material shall be disposed of off-site at an appropriate disposal facility. During construction, the soil material may be temporarily stockpiled on-site in such a manner that it cannot again result in sediment transportation on or off-site.

3.04 POLLUTION CONTAINMENT AREA

A. EARTH BERM

- 1. Develop containment area by constructing earth berms in accordance with the plan detail. Onsite soil free of organic material and rocks larger than 1" in diameter may be used for the earth berms.
- 2. Grade the area outside of the earth berms to direct storm runoff away from the containment area.

B. STRAW BERM

1. Sweep clean the existing pavement surface within the containment area, to either side and immediately upstream and downstream prior to constructing the containment berms.
2. Develop containment area by constructing straw bale and sandbag berms in accordance with the plan detail.

C. MAINTENANCE

1. Routinely inspect the containment structure (berm) to ensure that it is intact and provides the required freeboard. Provide additional materials and reform or replace the berm as necessary to maintain its integrity.
2. Regularly remove and properly dispose of offsite all pollutants deposited within the containment area, in accordance with all applicable local, state and federal laws.

3.05 DISPOSAL

- A. Remove from the work area, transport to a suitable off-site location, and legally dispose of all unsuitable soil materials, rubbish, debris and other pollutants resulting from construction operations.
- B. Burning is not permitted within the work area.

3.06 PROJECT COMPLETION

- A. Upon completion of the project, including landscaping and site cleanup, and in a timely manner:
 1. Submit to the District the Records listed in Subsection 1.09.

Section continues on next page.

3.07 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of these Specification section.

Contractor's [Contractor is to acknowledge with initials each submittal included]
Initials: _____

_____ Letter of explanation attached for each submittal not included.

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE

- _____ 1. Submit manufacturer's product data indicating tensile strength and E.O.S. for silt fence / silt trap fabric.
- _____ 2. Submit material type and dimensions for silt fence posts.
- _____ 3. Submit manufacturer's product data indicating burst strength, ultra violet stability and permeability for sandbags and gravel bags.
- _____ 4. Submit sieve analysis for gravel bag fill material.

Section continues on next page.

3.08 CONTRACTOR'S STORM WATER POLLUTION PREVENTION DECLARATION

A. As Contractor for this project, we hereby declare as follows:

1. We understand it is our responsibility to construct and maintain pollution prevention measures, including those for erosion and sediment control, as necessary to prevent any pollutant at any level from being conveyed off the construction site and that these measures must continue to be maintained until the required post-construction pollution prevention measures are in place and completely functional, including permanent landscaping.
2. We understand that site development and storm characteristics will evolve over the course of construction and that it is our responsibility to not only implement storm water pollution prevention measures, but to make adjustments and expansion in the implementation as necessary to adapt to our construction operations and schedule and to address evolving site conditions and actual weather conditions.
3. We understand it is our responsibility to train employees and subcontractors regarding these requirements and to maintain records of the installation, modification, inspection, and maintenance of storm water pollution prevention measures including, but not limited to: training, inspection, maintenance logs; record drawings showing locations, limits, and dates of installation for various measures; dated photographs and field sketches.
4. We are familiar with and agree to implement best management practice storm water pollution prevention measures including installation, routine inspection and maintenance, adjustments and expansion due to evolving site conditions, emergency maintenance and adjustments due to actual storm and site conditions, and documentation.

CONTRACTOR (FIRM)

LICENSE NO.

(AUTHORIZED SIGNATURE)

DATE

B. Contractor shall execute this Declaration and provide to District's Project Manager, with copies to Architect and Engineer, prior to start of construction.

END OF SECTION

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SECTION 321216 - ASPHALT CONCRETE PAVING**PART 1 - GENERAL****1.01 SUMMARY**

- A. Includes materials, equipment, transportation and labor as required for construction of asphalt concrete pavement including, but not limited to: subgrade preparation; aggregate base course; asphalt surfacing; seal coat.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 312500: Construction Storm Water Pollution Prevention
- C. Section 321723: Painted Pavement Markings

1.04 REFERENCE SPECIFICATIONS / REFERENCE DETAILS

- A. Construction materials and methods shall be in accordance with the *Standard Specifications and Standard Plans of the State of California Department of Transportation, 2010 editions* (CalTrans Standards). Where Metric Units of measure are used in the referenced Standards, the equivalent English Units shall be used. (Reference Specifications / Reference Details).
- B. Construction materials and methods shall be in accordance with the *Standard Specifications for Public Works Construction, 2021 edition* (SSPWC), published by Building News, Inc., except as modified or otherwise specified herein (hereinafter the Standard Specifications).
- C. In case of conflict between Reference Specifications / Details and these Project Specifications / Details, the more stringent provision shall govern, as determined by the Owner's Representative and Engineer.

1.05 GENERAL REQUIREMENTS

- A. R-VALUE TESTING

1. When the thicknesses of asphalt concrete surfacing and aggregate base courses given on the Detail Drawings are estimated, the actual thicknesses shall be determined as follows:
 - a. When the areas to be paved have been brought to rough subgrade elevation pursuant to requirements of Paragraph 3.02 of this Section, the Construction-Phase Geotechnical Engineer shall sample and test the subgrade soil for R-Value determination.
 - b. Based on the results of R-Value testing, the Construction-Phase Geotechnical Engineer will calculate the actual thicknesses of asphalt concrete surfacing and aggregate base courses required for the Traffic Indexes called for on the Detail Drawings.
- B. All work involving excavation including that for water, sewer, storm drain and utility conduits shall be completed and reviewed and approved by the Owner's Representative and the structural backfill reviewed and tested for compaction and approved by the Construction-Phase Geotech before paving and other permanent surface construction may commence.
- C. Compaction of fill, subgrade and base courses as well as trench bedding and backfill shall be tested for compliance with applicable requirements by the Construction-Phase Geotechnical Engineer.
- D. All existing and proposed valve and utility box covers, manhole and cleanout frames and covers, and catch basin frames and grates shall be carefully adjusted to finish grade in paved areas.
- E. Contractor shall provide vehicular and pedestrian traffic control including installing and maintaining fencing, signs, flagmen, lights, and barricades, as required.
- F. Contractor shall employ a Licensed Surveyor to provide line and grade control stakes for construction of subgrade, base and paving courses.

1.06 SUBMITTALS

- A. Provide submittals according to the Conditions of the Contract and Division 1 "Submittal Procedures" section.
- B. Refer to "Submittal Requirements and Schedule" at the end of this Section.

1.07 RECORD DOCUMENTS

- A. Comply with requirements of Division 1, "Project Record Documents" section.

PART 2 - MATERIALS

2.01 HEADERS

- A. Wood for headers shall be redwood.

2.02 AGGREGATE BASE

- A. Aggregate base material shall be Crushed Aggregate Base conforming to Section 200-2.2 of the Standard Specifications (SSPWC).

2.03 ASPHALT CONCRETE

- A. Asphalt concrete shall be the product of mixing mineral aggregate and a maximum of 15 percent reclaimed asphalt pavement (RAP) with paving asphalt, in conformance with Section 203-6 of the Standard Specifications (SSPWC).
- B. Paving Asphalt shall be performance grade PG 64-10, in conformance with Section 203-1 of the Standard Specifications (SSPWC).
- C. Asphalt concrete designated by class and grade for various applications shall be as follows:
 - 1. Finish Course, Traffic: C2-PG 64-10-RAP
 - 2. Base Course, Traffic:
(If more than 1 layer) B-PG 64-10-RAP
 - 3. Overlay, Traffic: C2- PG 64-10-RAP
 - 4. Finish Course, Non-Traffic: D2- PG 64-10-RAP
 - 5. Leveling Course and
Skin Patching: D2- PG 64-10-RAP

2.04 TACK COAT

- A. Paint binder shall be ss-1h emulsified asphalt conforming to Section 203-3 of the SSPWC.

2.05 SEALCOAT – ASPHALT BASED

- A. Materials shall conform to Section 203-9 of the SSPWC.

- 2.06 The composition of all cutback and emulsified asphalt used in the manufacture, placement or maintenance of asphalt concrete pavement shall conform with the County of San Luis Obispo Air

Pollution Control District. Contractor shall maintain records available for inspection for a period of 2 years which document the types and amounts of asphalts used.

- 2.07 Paint for pavement striping and marking shall conform to Section 321723 hereof.
- 2.08 Reflective glass beads are required for striping and marking in roadways but not for those in parking lots.
- 2.09 Posts for mounting signs shall be 2" standard weight (3.65 pounds per foot) galvanized steel pipe, supplied with galvanized threaded cap.
- 2.10 Pre-cast concrete wheelstops shall be 4'-long, anchored with two 18"-long #4 rebars.

PART 3 - EXECUTION

3.01 PROTECTING EXISTING PAVEMENT AT SAWCUT

- A. After marking location of proposed sawcut on existing A.C. pavement surface but before cutting, document condition of pavement along sawcut line; provide photographic record to Owner's Representative, with any existing damage highlighted.
- B. Protect integrity of sawcut line and existing pavement to remain behind sawcut line until construction of conforming improvements.
- C. If existing pavement is broken-off or otherwise damaged along or behind sawcut line before new pavement is placed, sawcut a new conform line parallel with, full length of, and sufficient distance behind original sawcut line so as to remove damaged pavement and / or irregularity along conform line and replace with new pavement section, at no additional cost to Owner.
- D. Overcutting is not allowed in sawcutting of existing asphalt concrete pavement and appurtenant concrete improvements; the saw shall be stopped short of an overcut and the remainder of the cut constructed by drilling, to make a smooth, clean corner.

3.02 GRADING PROCEDURE UNDER PAVEMENT AREAS

- A. These grading procedures apply to all areas within, and extending a minimum of 1 foot outside of, the limits of asphalt or concrete pavement and the limits of curb, gutter, and sidewalk contiguous with the pavement.
- B. Excavate existing soil to a depth which removes all existing non-complying fill and disturbed natural soils, as determined by the Construction-Phase Geotechnical Engineer, or to the bottom of the proposed base course, whichever is deeper.

- C. Before proceeding with scarification and recompaction of soil below subgrade level, request observation and testing of surfaces exposed per Paragraph 3.02B hereinabove by Construction Phase Geotechnical Engineer who will determine:
 - 1. Whether or not scarification and recompaction should be performed. Scarification of soil to 9" below subgrade elevation and recompaction to minimum 95% of maximum density is required unless otherwise recommended in writing during construction by the Geotechnical Engineer.
 - 2. Whether or not stabilization of subgrade soils pursuant to Paragraph 3.02H hereinbelow is necessary. If yielding subgrade warranting stabilization is observed, corrective measures will be recommended by Geotechnical Engineer and direction for proceeding given by District as extra work pursuant to provisions of the Contract Documents.
- D. For fill required to achieve subgrade elevations, use on-site soil or imported soil meeting the requirements of the Geotechnical Engineer for fill material. Condition, place, and compact this material to minimum 90% of maximum density to a level at least 9 inches below aggregate base material in pavement areas. Compact remaining fill to bottom of aggregate base material or sand course to minimum 95% of maximum density.
- E. Moisten or dry scarified soil and fill material to near the optimum moisture content before compacting.
- F. For those areas where specific thicknesses of surfacing and base courses are given on the Detail Drawings, finish grading to required subgrade elevations.
- G. For those areas where estimated thicknesses of surfacing and base courses are given on the Detail Drawings, bring the areas to rough subgrade elevations based on the estimated thicknesses; request determination by the Construction-Phase Geotechnical Engineer of actual thickness of pavement surfacing and base courses based on the results of R-Value tests to be conducted on the rough subgrade material and the Traffic Index(es) shown on the Detail Drawings; perform additional grading if necessary to adjust subgrade elevations to accommodate the final pavement structural section thickness.
- H. Proof-roll finish subgrade with heavy, rubber-tired construction equipment under the observation of the Construction-Phase Geotechnical Engineer; surface shall be firm and unyielding. Address yielding or overwet / pumping subgrade areas as recommended by the Construction-Phase Geotechnical Engineer.
- I. Request observation and testing of finish subgrade condition by Construction-Phase Geotechnical Engineer and do not proceed with paving operations until subgrade condition has been approved.

3.03 GRADING TOLERANCES

- A. Do all rough and finish grading as necessary to bring the site to the lines and grades called for on the Drawings and within the following tolerances:
 - 1. Finish surface of the subgrade soil beneath base course shall not vary more than $\frac{1}{2}$ inch (0.04 foot) from the design elevation, slope and cross section, established with due allowance for thicknesses of base course and surfacing. Variations within the specified tolerance shall be compensating such that the average elevation, slope, and cross section conform to those specified per plan.
 - 2. Finish surface of the base course for pavements and for walks, ramps, gutters, driveway aprons, and other pavement-related structures shall not vary more than $\frac{1}{2}$ inch (0.04 foot) from the design elevation, slope and cross section, established with due allowance for thickness of surfacing. Variations within the specified tolerance shall be compensating such that the average elevation, slope, and cross section conform to those specified per plan.

3.04 WOOD HEADERS

- A. Construct wood header to form all pavement edges not contained by concrete.

3.05 AGGREGATE BASE

- A. Place aggregate base material and compact to minimum 95% of maximum density.
- B. Confirm that finish base course has been constructed to the design elevation, slope, and cross section within tolerances specified in Subsection 3.03 hereof. Reconstruct and reconfirm as necessary for conformance before proceeding with placement of surfacing.

3.06 TACK COAT

- A. Apply a paint binder of asphaltic emulsion at the rate of 0.15 gallons per square yard of surface to existing vertical surfaces against which paving will be placed and between pavement courses constructed more than 24 hours apart.

3.07 SURFACING

- A. Construct asphalt concrete surfacing in conformance with Section 302-5 of the *SSPWC*.
- B. If total asphalt concrete thickness is greater than 4 inches (0.33 foot), spread and compact it in two (2) equally-thick layers with the top layer (finish course) not less than 2 inches (0.17 foot) in compacted thickness.

- C. Construct the asphalt concrete true to grade and cross section. Upon completion, the surface shall be free of any unevenness greater than ¼ inch (0.02 foot) when checked with a 10-foot long straightedge placed on the surface of the pavement.

3.08 ADJUSTING STRUCTURES

- A. Carefully adjust the perimeter edge of valve and utility box covers, manhole and cleanout frames and covers, and catch basin frames and grates to conform with finish pavement surface.

3.09 FLOOD TEST

- A. After construction of A.C. pavement and appurtenant concrete features but before seal coating and painting striping and markings, conduct a flood test to review surface drainage, as follows:
 - 1. Supply and discharge water in sufficient quantity to completely wet and cover all A.C. pavement and concrete gutter areas and allow to drain/dry for one hour at 70° F or warmer. Mark the outline limits of residual standing water deep enough to cover a 5 cent piece.
 - 2. Remove and replace A.C. pavement and concrete gutter improvements at no additional cost to the Owner, as necessary to provide positive surface drainage and to prevent ponding of water on pavement surfaces and in gutters. Substitution of asphalt concrete skin patch in lieu of removal and replacement of pavement shall be at the sole discretion of the Owner.
 - 3. Conduct additional flood testing to confirm success of corrective measures.

3.10 REMOVING EXISTING PAVEMENT MARKINGS

- A. Remove existing striping and pavement and curb markings which conflict with new work shown on the plans by water blasting or by sand blasting, at contractor's option; however, if water blasting is used and does not completely remove existing striping and markings as determined by the Owner's Representative, follow-up use of sand blasting is required. All A.C. pavement areas subjected to blasting (water or sand) shall be seal coated.

3.11 SEALCOAT

- A. Construct Sealcoat at the rate of 0.45 gallons per square yard of surface on all new and existing pavement within work site in accordance with Section 302-8 of the SSPWC.
- B. A tack coat conforming to Section 302-8.2.1 shall be applied to existing pavement surfaces in advance of sealcoat.

- C. Sealcoat shall not be applied to new asphalt pavement until the pavement has cured for 7 days.

3.12 PAVEMENT MARKING

- A. See Section 321723.

3.13 SIGNAGE

- A. Provide and install signs in accordance with the Drawings and Detail Drawings.

3.13 WHEELSTOPS

- A. Install pre-cast concrete wheelstops anchored with two 18"-long #4 rebars.

Section continues on next page.

3.14 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of this Specification Section, unless a substitute product is being proposed, in which case refer to Division 1, "Substitutions" section, for substitution requests.

Contractor's [Contractor is to acknowledge with initials each submittal included]
Initials: _____

_____ Letter of explanation attached for each submittal not included.

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE

_____ 1. Submit mix design for Asphalt Concrete.

_____ 2. Submit laboratory test results for Crushed Aggregate Base.

_____ 3. Submit mix design for Sealcoat.

END OF SECTION 321216

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SECTION 321313 - SITE CONCRETE**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Provide materials, equipment and transportation and perform labor as required for construction of Portland cement concrete improvements including, but not limited to: subgrade preparation; aggregate or sand base course; concrete pavement, curbs, gutters, walkways, ramps, drainage structures, post footings.
- B. This work does not include concrete associated with the buildings or retaining walls.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.03 WORK INCLUDED

- A. Form work, shoring, bracing and anchorage
- B. Concrete reinforcement and accessories
- C. Cast-in-place concrete

1.04 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 015100: Field Engineering
- C. Section 312000: Site Grading
- D. Section 321313.10: Site Concrete Reinforcement

1.05 REGULATORY REQUIREMENTS

- A. Construction shall comply with the *California Code of Regulations, Title 24, Part 2* (the *California Building Code*), most recent effective edition.

1.06 REFERENCE SPECIFICATIONS

- A. ASTM C33 – Concrete Aggregates
- B. ASTM C94 – Ready Mixed Concrete

- C. ASTM C150 – Portland Cement
- D. ASTM A615 – Deformed and Plain Billet-steel for Concrete Reinforcement
- E. ASTM C309 – Liquid Membrane-forming Compounds for Curing Concrete
- F. *California Building Code*, Chapter 19, Concrete
- G. *Standard Specifications for Public Works Construction, 2021 edition (SSPWC)*, published by Building News, Inc.

1.07 GENERAL REQUIREMENTS

A. R-VALUE TESTING

1. When the thicknesses of concrete surfacing and aggregate base courses for vehicular traffic areas given on the Detail Drawings are estimated, the actual thicknesses shall be determined as follows:
 - a. When the areas to be paved with concrete have been brought to rough subgrade elevation pursuant to requirements of Section 312000 hereof, the Construction-Phase Geotechnical Engineer shall sample and test the subgrade soil for R-Value determination.
 - b. Based on the results of R-Value testing, the Construction-Phase Geotechnical Engineer will calculate the actual thicknesses of concrete surfacing and aggregate base courses required for the Traffic Index(es) called for on the Detail Drawings.
- B. All work involving excavation including that for water, sewer, storm drain and utility conduits shall be completed and reviewed and approved by the Owner's Representative and the structural backfill reviewed and tested for compaction and approved by the Construction Phase Geotechnical Engineer before paving and other permanent surface construction may commence.
- C. Compaction of fill, subgrade and base courses as well as trench bedding and backfill shall be tested for compliance with applicable requirements by the Construction-Phase Geotechnical Engineer. Compaction tests shall be in accordance with ASTM Standard D-1557-91.
- D. All existing and proposed valve and utility box covers, manhole and cleanout frames and covers, and catch basin frames and grates shall be carefully adjusted to finish grade in paved areas.
- E. Contractor shall provide vehicular and pedestrian traffic control including installing and maintaining fencing, signs, flagmen, lights, and barricades, as required.
- F. Contractor shall employ a Licensed Surveyor to provide line and grade control stakes for construction of subgrade, base, and paving and for construction of curb and gutter, walks, and drainage structures.

1.08 SUBMITTALS

- A. Provide submittals according to the Conditions of the Contract and Division 1 "Submittal Procedures" section.
- B. Refer to "Submittal Requirements and Schedule" at the end of this Section.

1.09 RECORD DOCUMENTS

- A. Comply with requirements of Division 1, "Project Record Documents" section, and following:
 - 1. Accurately record changes in construction from that called for on the Drawings and Specifications, including unexpected physical conditions and unmarked or inaccurately marked existing pipelines, conduits and structures, for Record Documents.

1.10 QUALITY ASSURANCE

- A. Specified cement and specified aggregates shall be supplied from single sources only.

1.11 TESTS

- A. Testing and analysis of concrete will be performed under provisions of Division 1, "Testing and Inspection" section.

1.12 REQUIRED SACRIFICIAL CONCRETE MOCK-UP

- A. Prior to scheduling first concrete pour for permanent improvements, construct a trial concrete slab with monolithic curb to demonstrate jointing and finishing techniques for approval or comment by Owner.
- B. Sacrificial slab shall be minimum 10'-long, 5'-wide, 4"-thick un-reinforced concrete with monolithic 6"-high and wide curb; concrete shall be per approved mix design.
- C. Construct one transverse control joint and one transverse expansion joint continuous through slab and curb.
- D. Construct chamfered and / or radiused edge treatments as applicable to the work.
- E. Construct medium broom finish across ½ of slab and heavy broom finish across ½ of slab.
- F. Review with Owner and Architect / Engineer; construct improvements throughout project in accordance with approved mock-up and revisions requested by Owner.
- G. Maintain mock-up for comparison throughout the construction period; remove and dispose of off-site after completion of concrete improvements.
- H. Refer to Paragraph 3.10 for colored concrete mockup requirements.

PART 2 - MATERIALS

2.01 BASE MATERIAL

- A. Sand base material shall be imported clean sand of such gradation that 90% to 100% passes through a No. 4 sieve, less than 5% passes through a No. 200 sieve, and the Sand Equivalent value is greater than or equal to 40. For processed sand, a maximum of 15% shall pass through a No. 200 sieve.
- B. Aggregate base material shall be Crushed Aggregate Base conforming to Section 200-2.2 of the Standard Specifications (SSPWC).

2.02 FORM MATERIALS

- A. GENERAL: Shall conform to California Building Code, Section 1906A, Formwork, Embedded Pipes and Construction Joints.
- B. PLYWOOD FORMS: Douglas Fir species; solid-one-side, sound undamaged sheets. Unless otherwise called for on plans, surface of form side against concrete shall provide a medium density texture.
- C. LUMBER: Douglas Fir species; construction grade with grade stamp clearly visible.
- D. STEEL FORMS: Minimum 16 gage thick, stiffened to support weight of concrete with minimum deflection.
- E. FORM TIES: Removable metal of adjustable length, cone ends.

2.03 REINFORCING STEEL

- A. All reinforcing shall be fabricated from steel manufactured in the United States.
- B. Reinforcing steel shall be deformed billet-steel for concrete reinforcement conforming to ASTM A-615, Grade 60 for bar sizes No. 4 and larger, Grade 40 for bar size No. 3, Grade 60 acceptable for all sizes.
- C. Welded bars shall conform to the most recent issue of ASTM Standard A-706, Grade 60 for all bar sizes.

2.04 CONCRETE MATERIALS

- A. CEMENT: Shall be Type II, low alkali (no higher than 0.4%), conforming to ASTM C-150.
- B. AGGREGATES (COARSE AND FINE): All aggregate used in concrete shall conform to ASTM C-33. Aggregate shall be uniformly graded, with the maximum aggregate size being $\frac{3}{4}$ " to 1", and the ratio of coarse aggregate to fine aggregate being approximately 60% to 40% (by weight), respectively.

- C. Coarse and fine aggregate (sand) are to come from a source proven to have non-reactive characteristics. Coarse aggregate which is heavy media processed (Saticoy, Sisquoc), Santa Margarita rock, or San Gabriel rock will be considered as meeting the criteria of non-reactivity. Moorpark sand (Quality, Best, Blue Star) will be considered as meeting the requirements of non-reactivity. Other aggregates meeting or exceeding the aggregate reactivity characteristics of the aggregates listed above are acceptable upon submittal of adequate documentation (ASTM C-289 and ASTM C-277 test results that are not more than 2 years old).
- D. WATER: shall be clean, suitable for human consumption, and not detrimental to concrete.

2.05 CURING COMPOUND

- A. Shall be water-base liquid membrane-forming compound conforming to ASTM C309, 1100 Clear Series manufactured by W.R. Meadows, Inc., Hampshire, Illinois, or equivalent, for use on exterior flatwork only.
- B. Liquid membrane-forming compound shall be applied at the rate of 1 gallon per 200 square feet, in 2 coats, the second coat applied at right angles to the first.

2.06 BONDING AGENT

- A. Shall be polyvinyl acetate HIBOND manufactured by Lambert Corporation, Orlando, FL, LOCK BOND NO. 906 manufactured by MacklanBurg-Duncan Co., City of Industry, CA, or equivalent.

2.07 CONCRETE MIX

- A. Mix and deliver concrete in accordance with *California Building Code*, Section 1905A.
- B. Have mix designed and certified by a registered civil engineer, licensed in California.
- C. Select proportions for concrete in accordance with the approved design mix.
- D. Provide concrete conforming to the following criteria:

Element	Strength Min. 28-day	Weight	Min. Cement Content	Max. Agg. Size	Max Slump	Wat/Cem Ratio	Admixtures
Curbs, gutters, ramps, walks & flatwork	3,000 psi	150 pcf	5.5 sacks/C.Y.	3/4-inch	4 inches	0.55	See p. E
Drainage & stair structures; pavement	4,000 psi	150 pcf	6.5 sacks/C.Y.	1-inch	4 inches	0.50	See p. E

E. Include the following admixtures:

1. 1.5% air entrainment
2. 15% fly ash, Type N or F only
3. Low range water reducer

F. The use of a pea gravel mix (3/8" aggregate) concrete is expressly prohibited.

2.08 EXPANSION JOINT

A. Filler material shall be preformed bituminous type conforming to ASTM Standard D-1751.

B. Dowel tubing shall be plastic SPEED DOWEL supplied with sacrificial plate for attaching to form, as supplied by Aztec Concrete Accessories, or approved equivalent.

2.09 REMOVABLE JOINT CAP

A. High impact polystyrene, depth equal to width of expansion joint filler, supplied in 10-foot lengths, as manufactured by Concrete Tie, or equivalent.

B. Where polyurethane sealant primers are used, a bondbreaker tape shall be applied prior to caulking.

2.10 JOINT SEALANT

A. For crack-control and expansion joints shall be chemical-cure, two-component, polyurethane-base, non-sag elastomeric Sikaflex-2cNS manufactured by Sika Corporation, Lyndhurst, NJ, or approved equivalent. Color: Limestone Grey.

2.11 ABRASIVE STAIR NOSING

A. PRODUCT: Type 231BF (3 inch wide) by Wooster or approved equivalent by Balco or American Safety Tread.

B. COLOR: Safety Yellow for Drop-Off / Loading Isle Curb, Black for Exterior Stairs and Steps, or as required by Architect; confirm in advance. Color used must provide 70% contrast from color of curb or stair tread surface.

C. LENGTH: Length of stair tread or of Drop-off / Loading Isle curb, less 3 inches on each end.

2.12 NON-SLIP PAINT

A. PRODUCT: For visually impaired warning strips shall be EPOTUFF ES-83 Epoxy as manufactured by No Skidding Products, Inc. [(416) 667-1783], or approved equivalent.

- B. COLOR: Safety Yellow for Drop-Off / Loading Isle Curb (special order), Black for Exterior Stairs and Steps, or as required by Architect; confirm in advance. Color used must provide 70% contrast from color of curb or stair tread surface.

2.13 EPOXY, FLATWORK DOWELS

- A. Epoxy used for grouting rebar dowels to maintain joint integrity between site flatwork components (curbs, gutters, walkways, ramps) shall be Simpson SET-XP Adhesive, ICC No. ESR-2508, or equivalent. Pull tests are not required.

2.14 WATERPROOFING

- A. Shall be MERLEX SUPER BLOCKADE cement-based coating as supplied by Concrete Tie Co., Ventura, CA, or approved equivalent, applied in two coats.
- B. Color of first coat: white; color of second coat: gray.

2.15 SKATEBOARD DETERRENT DEVICES

- A. Grinder Minders as manufactured by Grind To A Halt, Inc., or equivalent, with brushed stainless steel finish.
- B. Install in strict accordance with manufacturer's specified procedures.
- C. Install skate stop devices on raised curbs and walls contiguous with or adjacent to paved walking and driving surfaces, unless waived in writing by the Districts. Skate stop devices shall not be installed where top of curb or wall is part of a walking surface and could result in a trip hazard (such as pavement edge curb flush with contiguous sidewalk).
- D. On ramps, install skate stop devices on edge curbs and walls centered between each pair of handrail posts, not to exceed 4' spacing, continuous the full length of the ramp. Adjust spacing as necessary to clear edge of expansion, construction, or crack control joint by 3 inches.
- E. On curbs and walls not containing rail posts, install skate stop devices located 18" from end of, or angle point in, curb / wall and at 36" maximum spacing continuous along full length of curb / walls.
- F. Provide Shop Drawing detailing proposed locations of all skate stop devices for review and approval in advance of installation.

2.16 DETECTABLE WARNING PAVERS

- A. MANUFACTURER: Wausau Tile, or equivalent.
- B. PRODUCT: Precast Concrete Truncated Dome ADA Compliant Warning Paver.

- C. COLOR: Terra Cotta.
- D. APPLICATION: Subject to vehicular traffic loading.
- E. INSTALLATION: In accordance with manufacturer's recommendations.

PART 3 – EXECUTION

3.01 PROTECTING EXISTING CONCRETE AT SAWCUT

- A. After marking location of proposed sawcut on existing concrete improvement surface but before cutting, document condition of concrete along sawcut line; provide photographic record to Owner's Representative, with any existing damage highlighted.
- B. Protect integrity of sawcut line and existing concrete improvements to remain behind sawcut line until construction of conforming improvements.
- C. If existing concrete is broken-off or otherwise damaged along or behind sawcut line before new concrete is placed, sawcut a new conform line parallel with, full length of, and sufficient distance behind original sawcut line so as to remove damaged concrete and / or irregularity along conform line and replace, at no additional cost to Owner.
- D. Overcutting is not allowed in sawcutting of existing concrete pavement and flatwork; the saw shall be stopped short of an overcut and the remainder of the cut constructed by drilling, to make a smooth, clean corner.

3.02 GRADING PROCEDURE UNDER SITE CONCRETE IMPROVEMENT AREAS

- A. These grading procedures apply to all areas within, and extending a minimum of 1 foot outside of, the limits of asphalt or concrete pavement and the limits of curb, gutter, sidewalk, ramps and stairs.
- B. Excavate existing soil to a depth which removes all existing non-complying fill and disturbed natural soils, as determined by the Construction-Phase Geotechnical Engineer, or to the bottom of the proposed base course, whichever is deeper.
- C. Before proceeding with scarification and recompaction of soil below subgrade level, request observation and testing of surfaces exposed per Paragraph 3.02B hereinabove by Construction Phase Geotechnical Engineer who will determine:
 - 1. Whether or not scarification and recompaction should be performed. Scarification of soil to 9" below subgrade elevation and recompaction to minimum 95% of maximum density is required unless otherwise recommended in writing during construction by the Geotechnical Engineer.

2. Whether or not stabilization of subgrade soils pursuant to Paragraph 3.02H hereinbelow is necessary. If yielding subgrade warranting stabilization is observed, corrective measures will be recommended by Geotechnical Engineer and direction for proceeding given by District as extra work pursuant to provisions of the Contract Documents.
- D. For fill required to achieve subgrade elevations, use on-site soil or imported soil meeting the requirements of the Geotechnical Engineer for fill material. Condition, place, and compact this material to minimum 90% of maximum density to a level at least 9 inches below sand or aggregate base material. Compact remaining fill to bottom of sand or aggregate base material to minimum 95% of maximum density.
- E. Moisten or dry scarified soil and fill material to near the optimum moisture content before compacting.
- F. For those areas where specific thicknesses of surfacing and base courses are given on the Detail Drawings, finish grading to required subgrade elevations.
- G. For those areas where estimated thicknesses of surfacing and base courses are given on the Detail Drawings, bring the areas to rough subgrade elevations based on the estimated thicknesses; request determination by the Construction-Phase Geotechnical Engineer of actual thickness of pavement surfacing and base courses based on the results of R-Value tests to be conducted on the rough subgrade material and the Traffic Index(es) shown on the Detail Drawings; perform additional grading if necessary to adjust subgrade elevations to accommodate the final pavement structural section thickness.
- H. Proof-roll finish subgrade with heavy, rubber-tired construction equipment under the observation of the Construction-Phase Geotechnical Engineer; surface shall be firm and unyielding. Address yielding or overwet / pumping subgrade areas as recommended by the Construction-Phase Geotechnical Engineer.
- I. Request observation and testing of finish subgrade condition by Construction-Phase Geotechnical Engineer and do not proceed with paving operations until subgrade condition has been approved.

3.03 FORMWORK

- A. Verify lines, grades and dimensions and bring all discrepancies to the attention of the Architect / Engineer for resolution before proceeding with formwork.
- B. Where it will not be exposed to view, foundation concrete may be placed directly into neat excavations (earth forms) provided the foundation trench walls are firm and stable, as determined by the engineer and the geotechnical engineer, and such placement is approved by the Division of the State Architect and the Owner's Representative.
- C. Where earth forms are allowed to be used, cut excavations neatly and accurately to size for placement of concrete directly against the excavation and, except for bottom of footings, trim the

excavation to allow for one inch of additional concrete beyond the dimensions or profiles shown on the Drawings. Hand trim sides and bottom of excavation, remove debris and loose soil, and construct formwork along each side of excavation at top to secure reinforcing and prevent sloughing; the minimum form work shown on the Drawings is mandatory to insure a clean excavation immediately prior to and during placement of concrete.

- D. Request observation and testing of Finish Subgrade condition by Construction Phase Geotechnical Engineer and do not proceed with placement of base material, form work, or reinforcing until subgrade condition has been approved.
- E. For concrete pavement, confirm that finish base course has been constructed to the design elevation, slope, and cross section within tolerances specified in Section 312000, Subsection 3.03B, pursuant to Section 015100 Field Engineering. Reconstruct and reconfirm as necessary for conformance before proceeding with placement of surfacing.
- F. Where called for, place base material and compact to minimum 95% density of maximum density. Request observation and testing and do not proceed with form work or reinforcing until thickness and compaction density of base material have been approved.
- G. Erect formwork, shoring and bracing to achieve design requirements, in accordance with Section 1906A, *California Building Code*.
 - 1. Remove old concrete which is set and dry from form boards.
 - 2. Provide bracing to ensure stability of formwork and shore or strengthen formwork subject to overstressing by construction loads.
 - 3. Arrange and assemble formwork, bracing, and shoring to permit dismantling and stripping without damage to concrete.
 - 4. Minimize the number of form joints; align joints and make watertight.
 - 5. Provide chamfer strips on external corners where called for on Detail Drawings.
 - 6. Layout joint spacing and mark on forms and request review by Owner's Representative.
- H. Protect staff, personnel and public from harm and accident during formwork. Conform to California Code of Regulations, Title 8, Subchapter 4, Construction Safety Orders.

3.04 POUR STOPS

- A. Construct separate concrete pours at all expansion joints and elsewhere as called for on the plans (pour stops). At least 48 hours shall separate concrete placement on each side of pour stop.

- B. At expansion joints serving as pour stops, edge of first pour shall be formed and speed dowel tubes installed. Expansion joint filler with removable joint cap shall serve as form for grade control and for tooling edge of second pour.

3.05 REINFORCEMENT

- A. Fabricate steel reinforcement in accordance with the Detail Drawings and Specifications. Where not detailed or specified, comply with the applicable requirements of Section 1907A of the *California Building Code* and the American Concrete Institute SP-66-88.
- B. Bend, cut, and place bars accurately. Bend bars cold at the mill; heating or field-bending of bars is not permitted. Do not bend or straighten bars in any manner that will damage the material.
- C. Place, support and secure reinforcement against displacement during pouring and consolidating concrete.
- D. Unless otherwise noted on Drawings, coverage for reinforcing bars (to face of bar) shall be as follows:
 - 1. Concrete in contact with earth, unformed: 3"
 - 2. Concrete in contact with earth, formed: 2"
 - 3. Wall, exterior face, #5 bar and smaller: 1 1/2"
 - 4. Wall, exterior face, #6 bar and larger: 2"
 - 5. Structural slab: 3/4"

3.06 PLACING CONCRETE

- A. Construct concrete improvements in accordance with the Drawings, Detail Drawings, and Specifications.
- B. Prior to scheduling concrete pour:
 - 1. Have excavation, form work and reinforcement reviewed and accepted by Owner's Representative.
 - 2. Have joint layout, as marked on forms in advance, reviewed and accepted by Owner's Representative.
 - 3. Where required gutter gradient is less than 1.0% (1/8 inch per foot), have a Licensed Surveyor confirm form elevations prior to ordering concrete.
 - 4. If there has been rainfall or other discharge of water to excavations after observation and testing pursuant to Paragraph 3.02F hereof, have subgrade re-reviewed and approved by Construction Phase Geotechnical Engineer.

- C. Notify Architect, Engineer, Structural Engineer, and Geotechnical Engineer / Testing Laboratory minimum 24 hours prior to commencement of concrete placement.
- D. PRIOR TO PLACING CONCRETE:
1. Carefully review excavation, form work, and reinforcement. Remove wood chips, debris, and loose soil; take out temporary bracing and cleats, box openings for pipes; secure forms, reinforcement, anchors, and embedded items in their proper places.
 2. Dampen forms and sides and base of excavation against which concrete will be placed by spraying with clean water; apply water sufficient to dampen forms / excavation while not causing erosion or standing water.
 3. Before placing new concrete against hardened concrete and before placing masonry on concrete, remove all incrustations and laitance from forms, reinforcing, and surface of hardened concrete. If the surface mortar and laitance of the first concrete pour has not been completely removed by water blasting, sandblast the hardened concrete surface to expose the coarse aggregate to ¼ inch amplitude. Surfaces which are to receive drypack shall also be prepared as herein specified.
- E. HANDLING AND PLACING:
1. Once concrete placement has started, carry on as a continuous operation until the section of approved size and shape is completed.
 2. Handle concrete as rapidly as practicable from the mixer to the place of final deposit by methods which prevent the separation or loss of ingredients. Deposit concrete as neatly as practicable, in its final position to avoid rehandling or flowing.
 3. Concrete shall not be dropped freely where reinforcing will cause segregation, nor shall it be dropped freely more than 4 feet.
 4. Maintain plastic surface approximately horizontal.
 5. Do not deposit concrete that has partially hardened in the work. Do not retemper or use concrete after having stood 15 minutes after leaving the truck or mixer.
 6. The total elapsed time between addition of water at the batch plant and complete discharge of the concrete load at the site shall not exceed 90 minutes.
 7. Thoroughly vibrate all concrete within 15 minutes after placement.
- F. VIBRATING AND COMPACTING:
1. Thoroughly consolidate concrete and compact by suitable means during the operation of placing and depositing. Thoroughly work concrete around reinforcement, embedded items, and into the corners of the forms. Thoroughly vibrate concrete adjacent to forms. Use internal vibrators under experienced supervision and keep out of contact with reinforcement and wood forms.

2. Vibrate close to the forms but do not continue at one spot to the extent that large areas of grout are formed or the heavier aggregates are caused to settle. Take care not to disturb concrete which has taken its initial set.

3.07 PROTECTION AND CURING

- A. GENERAL: Protect freshly deposited concrete from premature drying and excessively hot or cold temperatures, and maintain without drying at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete.
- B. INITIAL CURING: Initial curing shall immediately follow the finishing operation. Keep concrete continuously moist at least overnight. Use one of the following materials or methods:
 1. Ponding or continuous sprinkling.
 2. Use of curing compounds: Apply compounds in accordance with the manufacturer's recommendations. Do not use on surfaces against which additional concrete or other cementitious finishing materials are to be bonded or on surfaces on which such curing is prohibited by these specifications.
- C. FINAL CURING: Immediately following the initial curing and before the concrete has dried, accomplish additional curing using one of the following materials or methods:
 1. Continuing the method used in initial curing.
 2. Waterproof paper covering.
 3. Other moisture-retaining coverings as approved.
- D. DRILLING AND CORING: Drilling for anchors such as for skate stop devices and coring for post embedment shall not take place sooner than 28 days after placement of concrete.

3.08 WATERPROOFING

- A. Prepare the surface as recommended by the manufacturer of the waterproofing material.
- B. Apply the waterproofing to the limits identified on the Drawings and Detail Drawings in strict accordance with the manufacturer's recommendations.
- C. For brush-applied material, apply in two coats with delay between coats as recommended by the manufacturer; color of first coat shall be white and of second coat shall be gray.

3.09 EXISTING WORK

- A. Overcutting is not allowed in sawcutting of existing concrete pavement and flatwork; at changes in direction, stop the saw short of an overcut and drill to make a smooth, clean corner.
- B. Where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and set with epoxy grout.

- C. Prepare previously placed concrete by cleaning with steel brush and apply bonding agent in accordance with manufacturer's instructions.

3.10 COLORED WALKWAYS AND FLATWORK [IF CALLED FOR ON PLANS]

- A. Conform to Architect's requirements for color, finish, and joint / scoreline pattern.
- B. Construct a mockup for approval by Architect for each color required. Mockups shall contain an expansion joint, a control joint, and scorelines and shall be minimum of 10-feet long for walkways and minimum of 20-feet square for flatwork areas.
- C. Do not construct permanent colored concrete improvements without approval of mockup by Architect. If approved, mockup may remain as part of permanent work, provided it also conforms to all dimensional, structural, and geotechnical requirements.

3.11 CONCRETE FINISHES

- A. FORMED SURFACES: smooth finish.
- B. SIDEWALKS, RAMPS, EXTERIOR SLABS, PAVEMENTS: Non-slip surface finish shall be provided at all walk areas using a broom finish transverse to path of travel; medium broom (medium salt) where surface slope is less than 6%, heavy broom (slip resistant) where surface slope is 6% or greater, conforming to CBC Section 11B-302. Finishes shall be uniform throughout project.
- C. WATERPROOFING:
 - 1. Where waterproofing is called for on the Drawings, apply it in accordance with the manufacturer's instructions in two coats; apply the second coat at right angles to the first.
 - 2. Mask the interface line along finish grade to prevent application of waterproofing above grade.

3.12 JOINTS: CURB, CURB & GUTTER, GUTTER, WALK, RAMP

- A. CRACK CONTROL JOINTS
 - 1. Construct joints during the finishing operation in accordance with the Detail Drawings and these specifications.
 - 2. Construct transverse Crack Control Joints (deep-tooled weakened-plane joints) at regular intervals not exceeding 10-feet, directly above drain pipes which outlet through curb, and at locations called for on the Drawings or by the Owner's Representative. Longitudinal reinforcement shall be continuous through joint.
 - 3. Construct joints as follows: after preliminary troweling, part the concrete to a depth of 2 inches with a straightedge to create a division in the coarse aggregate. Then refloat the concrete to fill the parted joint with mortar. Mark the form headers to locate the weakened plane for final joint finishing, which shall be accomplished with a jointer tool having a depth

of 1/2 inch and a radius of 1/8 inch. The finished joint opening shall not be wider than 1/8 inch.

B. EXPANSION JOINTS

1. Construct transverse Expansion Joints at BCR, ECR, and at regular intervals not exceeding 40-feet. Construct additional expansion joints along edges of driveways and fixed objects and structures (fire hydrant, light standard, utility pole, drain inlet, manhole or valve cover, screen/retaining wall, building wall, etc.) and at locations called for on the Drawings or by the Owner's Representative. Do not construct Expansion Joints in cross or valley gutter which is separate from curb. Construct joints in accordance with the Detail Drawings and these Specifications.
2. Construct expansion joints 3/8-inch wide with one piece of preformed joint filler installed from bottom of slab to within 5/8-inch of concrete surface; install a 3/8-inch deep removable joint cap on the filler with the top of cap 1/4-inch below concrete surface; fill resulting reservoir with joint sealant to within 1/4-inch of concrete surface as soon after completion of the curing period as is possible. Joints shall be cleaned of all foreign material, including membrane curing compounds and all of the removable portion of the joint cap, and shall be surface-dry when sealer is installed.
3. Interrupt longitudinal reinforcing bars 3 inches clear of expansion joints and install minimum 16-inch long smooth dowels across, and centered on, the joint. Install one-half (one end) of dowel within a "Speed Dowel" tube; provide a 1-inch gap between the end of the dowel and the sealed end of the tube. For walks, ramps and flatwork, install 5/8" dowels centered vertically in slab and centered horizontally between each pair of longitudinal rebar. For curbs and curb and gutters, install 3/4" dowels centered between pairs of longitudinal rebar, horizontal and vertical (1 dowel for curb, 2 dowels for curb and gutter). Omit smooth dowels at BCR and ECR when curb radius is less than 5 feet.

C. Adjust joint spacing as necessary to align with those already constructed in existing adjacent (contiguous) features.

D. Along curves and through walk returns, joints shall be radial.

3.13 JOINTS: CONCRETE PAVEMENT

A. CRACK CONTROL JOINTS

1. Construct joints by sawcutting grooves as soon as concrete has hardened sufficiently to support the saw and the saw will not dislodge the concrete, but before six (6) hours after finishing of the concrete. An early entry saw such as the "Soff-Cut" saw by Soff-Cut International (800) 776-3328 is recommended.
2. Construct transverse and longitudinal Crack Control Joints (Contraction Joints) at regular intervals not exceeding 10-foot maximum spacing each way and at additional locations called for on the Drawings or by the Owner's Representative. Construct joints in

accordance with the Detail Drawings and these Specifications. Width of joints shall be ¼-inch, depth shall be 2 inches.

3. Fill sawcut joints with joint sealant to within ¼" of concrete surface as soon after completion of the curing period as is feasible and before pavement is opened to traffic. Joints shall be cleaned of all foreign material, including membrane curing compound, and shall be surface-dry when sealer is installed.

B. EXPANSION JOINTS

1. Construct Expansion Joints at locations called for on the Drawings or by the Owner's Representative. Construct joints in accordance with the Detail Drawings and these Specifications.
2. Construct expansion joints ½-inch wide with one piece of preformed joint filler installed from bottom of slab to within 1½" of concrete surface; fill resulting reservoir with backer rod and joint sealant to within ¼" of concrete surface as soon after completion of the curing period as is feasible and before pavement is opened to traffic. Joints shall be cleaned of all foreign material, including membrane curing compound, and shall be surface-dry when sealer is installed.
3. Interrupt reinforcing bars 3 inches clear of expansion joints and install minimum 18-inch long smooth dowels across, and centered on, the joint. Dowel diameter shall be 1 inch for 8 inch thickened slab, 1 ¼ inches for 10 inch thickened slab. Install one-half (one end) of dowel within a "Speed Dowel" tube; provide a 1-inch gap between the end of the dowel and the sealed end of the tube. Install dowels centered vertically in the thickened slab and centered horizontally between each pair of longitudinal rebar.

- C. Adjust joint spacing as necessary to align with those already constructed in existing adjacent (contiguous) curb, gutter, and sidewalk.

- D. Along curves, joints shall be radial.

3.14 REINFORCING STEEL

- A. Install reinforcing steel in concrete improvements in accordance with the Detail Drawings.
- B. Install reinforcing steel continuous through construction joints with a minimum 24-inch lap.
- C. Interrupt reinforcing steel at expansion joints and construct dowels across joints in accordance with Paragraphs 3.12-B and 3.13-B of this Section and the Detail Drawings.

3.15 ADJUSTING STRUCTURES

- A. Carefully adjust the perimeter edge of valve box, utility vault, and manhole frames and covers to conform with finish pavement surface.

3.16 SIGN POSTS

- A. Where sign post is to be installed in concrete pavement or walkway, accurately locate post and construct footing per the Detail Drawing monolithically with pavement or walkway. After concrete has cured, core drill and install sign post per the Detail Drawing.

3.17 FIELD QUALITY CONTROL

- A. Request inspection by Owner's Representative after forming and placing reinforcing steel and after marking joint / scoreline locations on forms but prior to scheduling the concrete pour. Provide at least 24-hours advance notice.
- B. The total elapsed time between addition of water at the batch plant and complete discharge of the concrete load at the site shall not exceed 90 minutes.

Thoroughly vibrate all concrete within 15 minutes after placement.
- C. Overcutting is not allowed in sawcutting of existing concrete pavement and flatwork; the saw shall be stopped short of an overcut and the remainder of the cut constructed by drilling, to make a smooth, clean corner.
- D. Survey forms for concrete walks and ramps prior to ordering concrete to insure that accessibility requirements for slope and cross-slope will be conformed with.
- E. Where design longitudinal gradient is less than 1% (1/8 inch per foot) survey gutter or curb and gutter forms prior to ordering concrete to ensure that design slope is being achieved.
- F. ACCEPTABLE TOLERANCES:
 - 1. Formed concrete features shall not vary more than 1/4 inch (0.02 foot) from design dimension (height, width or length) at any location.
 - 2. Formed concrete features shall not vary more than 1/4 inch (0.02 foot) from design line or grade at any location or along any 10' length.
 - 3. The faces of curbs and walls shall not vary more than 1/4 inch (0.02 foot) above or below the surface plane called for by the Drawings and Detail Drawings.
 - 4. The surface of concrete walks, ramps, and pavements shall be finished true to grade and cross section and shall be free of any unevenness greater than 1/4 inch (0.02 foot) when checked with a 10-foot long straight edge placed on the surface.
 - 5. In no case shall water pond in gutters or on concrete walks, pavement and flatwork. Pooled water is defined as that which covers a 5 cent piece after area is flooded and allowed to drain for one hour at 70° F or warmer.
 - 6. In no case shall maximum accessible slopes or cross-slopes be exceeded.

3.18 FLOOD TEST

- A. After construction of concrete site improvements including walks, steps, ramps, flatwork, pavement and gutters, conduct a flood test to review surface drainage, as follows:
 - 1. Supply and discharge water in sufficient quantity to completely wet and cover all site concrete surfaces including gutter areas and allow to drain/dry for one hour at 70° F or warmer. Mark the outline limits of residual standing water deep enough to cover a 5 cent piece with non-permanent marking crayon.
 - 2. Remove and replace site concrete improvements at no additional cost to the Owner, as necessary to provide positive surface drainage and to prevent ponding of water on surfaces and in gutters; removal and replacement shall be to the closest joint each way limits of from ponding.
 - 3. Conduct additional flood testing to confirm success of corrective measures.

3.19 DEFECTIVE WORK

- A. Defective concrete work shall be removed and replaced at Contractor's expense.

Section continues on next page.

3.20 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of this Specification Section, unless a substitute product is being proposed, in which case refer to Division 1, "Substitutions" section, for substitution requests.

Contractor's [Contractor is to acknowledge with initials each submittal included]
Initials:

_____ Letter of explanation attached for each submittal not included.

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE

1. Product Information

- _____ a. Submit concrete mix design for each class of concrete required.
- _____ b. Submit laboratory test results for all aggregate sources which confirm conformance with Paragraph 2.04 hereof.
- _____ c. Submit laboratory test results for aggregate base which confirm conformance with grading and quality requirements of Section 200-2.2 of the SSPWC.
- _____ d. Submit sieve analysis and Sand Equivalent value for sand base.
- _____ e. Submit mill affidavits stating the grades and physical and chemical properties of the reinforcing steel and conformance with ASTM Specifications.
- _____ f. Submit manufacturer's product data for joint filler, backer rod, and sealant, for epoxy grout, for waterproofing, for curing compound.
- _____ g. Submit manufacturer's product data for abrasive stair nosing.
- _____ h. Submit manufacturer's product data for non-slip paint for warning strips.
- _____ i. Submit manufacturer's product data for skateboard deterrent devices.
- _____ j. Submit manufacturer's product data for precast concrete detectable warning pavers.

2. Shop Drawings

- a. Prepare and submit shop drawings, drawn to scale, showing an elevation view of all retaining structures and detailing the locations of structure joints and form joints and snap tie layout.
- b. Prepare and submit shop drawings, drawn to scale, detailing locations of skateboard deterrent devices.

END OF SECTION

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SECTION 321314 - SITE CONCRETE REINFORCEMENT**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Provide materials, equipment and transportation and perform labor as required for supplying reinforcing steel for cast-in-place concrete pavement, curbs, gutters, walkways, ramps, drainage structures, retaining structures, post footings.
- B. This work does not include concrete reinforcement associated with the building(s).

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 321313: Site Concrete

1.04 REFERENCE SPECIFICATIONS

- A. ACI SP 66 – *Detailing Manual*
- B. ACI 318 – *Building Code Requirements for Reinforced Concrete*
- C. ASTM A 82 – *Steel Wire, Plain, for Concrete Reinforcement*
- D. ASTM A 615 – *Deformed and Plain Billet-steel for Concrete Reinforcement*
- E. CRSI MSP-1 – *Manual of Standard Practice*
- F. *California Building Code*, Chapter 19, Concrete

1.05 REGULATORY REQUIREMENTS

- A. Construction shall comply with the *California Code of Regulations, Title 24, Part 2* (the *California Building Code*), most recent effective edition.

1.06 SUBMITTALS

- A. Provide submittals according to the Conditions of the Contract and Division 1 "Submittal Procedures" section.
- B. Refer to "Submittal Requirements and Schedule" at the end of this Section.

1.07 RECORD DOCUMENTS

- A. Comply with requirements of Division 1, "Project Record Documents" section, and following:
 - 1. Accurately record changes in construction from that called for on the Drawings and Specifications for Record Documents.

1.08 QUALITY ASSURANCE

- A. All reinforcing shall be fabricated from steel manufactured in the United States.
- B. Specified reinforcing bars shall be supplied from single sources only.

1.09 TESTS

- A. Testing and analysis of reinforcing steel will be performed under provisions of Division 1, "Testing and Inspection" section.

1.10 DELIVERY, HANDLING AND STORAGE

- A. DELIVERY:
 - 1. Deliver bars new and free from rust and mill scale in original bundles tagged to identify placement and certify testing.
 - 2. If reinforcement arrives at the site without tags or certificates, testing by the Owner's testing laboratory will be required in accordance with Division 1, "Testing and Inspection" section or such reinforcement will not be accepted for incorporation into the Project; Contractor shall reimburse the Owner for the costs of such tests.
- B. HANDLING AND STORAGE
 - 1. Transport reinforcing steel to the construction site; store and cover it in a manner which will ensure that no damage occurs from moisture, dirt, grease, or other cause that might impair bond to concrete.
 - 2. Store a sufficient supply of approved reinforcing steel on the construction site at all times to ensure that there will be no delay in construction.
 - 3. Maintain identification of steel after bundles are broken.

1.11 COORDINATION

- A. Review architectural, structural, and civil drawings for anchor bolt schedules and for locations of anchors, inserts, conduits, sleeves, and other items which are required to be cast in concrete, and make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.

PART 2 - MATERIALS

- 2.01 REINFORCING BARS: New, deformed billet-steel bars, complying with ASTM A-615, grades as indicated on the drawings.
- 2.02 ACCESSORIES: Provide reinforcement accessories, consisting of spacers, chairs, ties, and similar items as required for spacing, assembling, and supporting reinforcement in place. Provide accessories fabricated from galvanized steel or approved plastic material, conforming to the applicable requirements of CRSI MSP-1.
- 2.03 TIRE WIRE: Galvanized steel wire conforming to ASTM A-82, except black steel may be used for concealed concrete work; 16 gauge, except heavier where indicated on the Drawings. Tie wire shall not protrude from concrete.

PART 3 – EXECUTION

3.01 FABRICATION

- A. Fabricate steel reinforcement in accordance with the details indicated. Where specific details are not indicated or noted, comply with the applicable requirements of CBC, Chapter 19, and ACI SP-66.
- B. Bend, cut, and replace bars accurately, as indicated. Bend bars cold at the mill; heating or field bending of bars is not permitted. Do not bend or straighten bars in any manner that will injure the material. Bars that have been heated for bending, bars with kinks or bends not indicated on the Drawings, and bars damaged by bending or straightening shall be removed and new reinforcement shall be provided.

3.02 PLACING

- A. GENERAL: Place reinforcing steel in accordance with the Drawings and the applicable requirements of CRSI MSP-1 and ACI 318. Install reinforcement accurately and secure against movement, particularly under the weight of workmen and the placement of concrete.
- B. REINFORCING SUPPORTS: Support bars on metal chairs or spacers on metal hangers, accurately placed and securely fastened to steel reinforcement in place. Support legs of accessories in forms without embedding in form surface. Space chairs and accessories in conformance with CRSI MSP-1. No wood will be permitted inside forms. Precast concrete cubes may be used to support reinforcing for footings and slabs on grade only.
- C. PLACING AND TYING: Set reinforcing in place, space, and securely tie at splices and at crossing points and intersections in the position indicated, or as directed. Point ends of wire away from forms.

- D. SPACING: Space bars as indicated. Where not indicated, the clear spacing for main longitudinal column reinforcement shall be not less than 1.5 times the nominal bar diameter, or 1-1/2 inches, or 1-1/3 times the maximum size aggregate, whichever is greater. For other parallel bars, where spacing is not indicated, the minimum clear spacing shall not be less than the nominal bar diameter, or one inch, or 1-1/3 times the maximum size aggregate, whichever is less. The clear distance limitations above also apply between the bars being spliced at a contact lap splice and adjacent bars.
- E. SPLICES: Except for temperature bars in slabs and horizontal wall reinforcing, no splicing will be allowed for reinforcing bars unless detailed locations are indicated, or approval is given. Wherever possible, stagger splices of adjacent bars.
1. Lapped splices shall not be used for bars larger than No. 11. Stagger lapped splices for horizontal wall reinforcing and slab temperature bars by the required lap splice length minimum.
 2. Welding of reinforcing steel will not be permitted.
 3. Make mechanical butt splices in accordance with the splicing device manufacturer's recommendations. Mechanical splices shall develop 125 percent of the specified minimum yield tensile strength of the spliced bars.
- F. DOWELS: Securely tie dowels in place before concrete is deposited. In the event there are no bars in position to which dowels may be tied, add a No. 3 minimum to provide proper support and anchorage. Bending of dowels after placement of concrete will not be permitted. Protect dowels extended for future construction from weather exposure. Strictly comply with safety law requirements for extended dowels.
- G. CLEANING: At time of concrete placement, reinforcement shall be clean and free of coatings that would impair bond to concrete; otherwise, clean reinforcing by sandblasting.
- H. Daylighting of tie wires is not permitted, no exception.
- 3.03 FIELD QUALITY CONTROL
- A. Notify the District Inspector at least 5 working days ahead of each concrete placement and do not place any concrete until all reinforcing steel has been installed and has been approved by the Inspector. Complete all reinforcing in every way by the end of the working day which precedes concrete placement. Reinforcement not placed in accordance with the Drawings shall be removed and replaced.
- B. Testing and inspections are specified in Division 1, "Testing and Inspection" section.

Section continues on next page.

3.04 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of this Specification Section, unless a substitute product is being proposed, in which case refer to Division 1, "Substitutions" section, for substitution requests.

Contractor's [Contractor is to acknowledge with initials each submittal included]
Initials:

_____ Letter of explanation attached for each submittal not included.

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE

1. Product Information

- _____ a. Submit Certified Mill Test Reports for the reinforcing bars being provided that states the strength grade(s) and A.S.T.M. Standards to which the bars have been fabricated and that the steel used in fabrication was manufactured in the United States.

2. Shop Drawings

- _____ a. Prepare and submit placement drawings showing the size, locations and spacing of reinforcing in the various parts of the structure, with details as required, in accordance with ACI SP-66. Placement drawings shall be complete so that placement of the reinforcing may proceed without reference to the design drawings. Do not submit cutting and bending lists.

END OF SECTION

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SECTION 321723 - PAINTED PAVEMENT MARKINGS**PART 1 – GENERAL****1.01 DESCRIPTION**

- A. Provide materials, equipment and transportation and perform labor as required for construction of painted pavement markings including, but not limited to: documenting characteristics and locations of existing pavement and curb markings, cleaning pavements and curbs, constructing painted markings.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 321216: Asphalt Concrete Paving

1.04 REFERENCE SPECIFICATIONS / REFERENCE DETAILS

- A. Construction materials and methods shall be in accordance with the *Standard Specifications and Standard Plans of the State of California Department of Transportation*, most recent effective editions (Caltrans Standards).
- B. In case of conflict between Reference Specifications/ Details and these Project Specifications / Details, the more stringent provision shall govern, as determined by the Architect and Engineer.

1.05 GENERAL REQUIREMENTS

- A. Contractor shall employ a licensed surveyor to provide basic layout control for striping, including:
 - 1. Begin and end of each parking lot bay.
 - 2. For angled parking, each end of stall stripe at least at each end of parking lot bay.
 - 3. Each corner of square or rectangular recreational courts.
 - 4. Radius points for curved stripes having radius less than 30 feet; points at 20' spacing for stripes having longer radii.
- B. For pavement rehabilitation work where plans call for existing pavement markings to be replaced in kind (parking lots or recreational areas), compile an accurately dimensioned record drawing which documents the following information in advance of damage to existing pavements:

1. layout and characteristics of existing lane lines and parking stall and access isle striping or recreational court lines, including: length, width and color of lines; degree of angled parking; width of lanes, stalls, bays and isles; dimensions of recreational courts.
2. location and size of parking stall designation legends and of recreational area legends.
3. location, type and size of directional arrows.
4. colors and limits of painted curbs and curb legends.
5. locations of limit lines and STOP legends.
6. locations and characteristics of other pavement legends, markings and delineation.
7. locations and color of speed bumps.

1.06 REGULATORY REQUIREMENTS

- A. Painting of accessible parking spaces and access isles shall comply with the *California Code of Regulations, Title 24, Part 2* (the *California Building Code*), most recent effective edition, and with provisions of the Americans with Disabilities Act.

1.07 SUBMITTALS

- A. Provide submittals according to the Conditions of the Contract and Division 1 "Submittal Procedures" section.
- B. Refer to "Submittal Requirements and Schedule" at the end of this Section.

1.08 RECORD DOCUMENTS

- A. Comply with requirements of Division 1, "Project Record Documents" section.

1.09 WARRANTY

- A. Provide minimum 5 year warranty per D.S.A. Bulletin 10/01/02, revised 9/27/04.

PART 2 – MATERIALS

2.01 PAINT

- A. Paint for pavement striping and marking shall be water-borne conforming to Section 84-3 of the Caltrans Standard Specifications.

2.02 PAINT COLORS

- A. Paint colors shall be Traffic White, Traffic Yellow, Traffic Red, Accessible Blue, or Green, as applicable to the Drawings; Accessible Blue shall be color No. 15090 in Federal Standard 595b.

1. In general, color uses are as follows:
 - a. Limit line and STOP legend: white.
 - b. Disabled parking stall and access isle stripes: blue.
 - c. Disabled parking legends: white.
 - d. Standard parking stall, island and access isle stripes: yellow.
 - e. Traffic lane lines: yellow or white.
 - f. Pavement markings and legends: yellow.
 - g. Fire Lane – No Parking lines and legends: red.
 - h. No Stopping curb: red.
 - i. Drop-off curb: white.
 - j. Disabled Parking and Drop-off curb: blue.
 - k. Recreational courts: yellow, blue, red, green.

2.03 LINE WIDTHS

- A. Parking lot lane, stall and islands: 4"-wide.
- B. Recreational court stripes: 2"-wide, unless otherwise noted on plans.
- C. Diagonal stripes for parking lot islands and access isles shall be at 5' spacing, center to center, except for accessible parking isles which shall have diagonal lines at 3' spacing, center to center.
- D. Limit line: 12"-wide.
- E. Tolerances
 1. Line lengths and widths plus or minus $\frac{1}{4}$ inch on straight segments and plus or minus $\frac{1}{2}$ inch on curved alignments.

2.04 PAVEMENT MARKING SIZES

- A. Pavement use legends: 12 inches tall.
- B. STOP legend: 8 feet tall.

2.05 PAVEMENT MARKINGS FOR THE DISABLED

- A. Painted lines and markings on pavements shall be 4" wide. When blue color is used, it shall be equal to color No. 15090 per Federal Standard 595B.
- B. Parking spaces for the disabled shall be marked according to CBC Sections 11B-502.3.
- C. Tactile warning devices shall be conformance with CBC Section 11B-247.1 and Section 321313 of these Specifications.
- D. Special warnings for disabled persons shall comply with CBC Sections 11B-247.1 / ADA Standards.
- E. Provide minimum 5 year warranty per DSA Bulletin 10/01/02, revised 9/27/04.

PART 3 – EXECUTION

3.01 LIMITATIONS

- A. Apply paint only to clean and dry surfaces, during favorable weather conditions, and when damage from precipitation, irrigation and traffic is not anticipated over the drying period.
- B. Apply paint only when temperature is above 50 degrees F during the drying period.
- C. Allow new pavement or seal coat to cure for 7 days minimum before applying paint.
- D. Allow first coat of paint to cure for 24 hours minimum before applying second coat.

3.02 PREPARATION

- A. Surfaces to be painted shall be dry and free of grease and loose dirt particles. Scrape and wire brush chipped or damaged paint on existing curbs. High pressure wash all curbs to be painted. Sweep and otherwise clean pavement as necessary to eliminate loose dust and other material before applying paint.
- B. Perform layout with chalk or lumber crayon only. Cat-track centerline and lane stripes for review by Owner's Representative prior to painting stripes.

3.03 APPLICATION

- A. Apply paint with mechanical equipment to produce uniform straight edges using equipment and templates specifically designed for this purpose.
- B. Apply all paint in two (2) coats with 24-hours minimum between coats.
 - 1. Each coat shall include two (2) complete passes with a coverage of not less than 1 gallon per 150 square feet.
 - 2. The paint application shall result in a uniform color and texture and shall completely cover and block-out the underlying surface; apply additional paint as necessary to achieve this result.
 - 3. The second coat after 24 hours may be waived by the owner, in the owner's sole discretion, based on a satisfactory results from first paint coat and cost credit offered by contractor.

3.04 CLEANING UP

- A. Remove drips, overspray, improper markings, and paint material tracked by traffic by sand blasting, wire brushing, or other method approved by Architect and Engineer.
- B. Incorrect or conflicting markings shall be removed by sand blasting, wire brushing or grinding. If surface is damaged, repair surface by heating, tack coating and placing asphalt concrete fines. No paint blackout allowed.

Section continues on next page.

3.05 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of this Specification Section, unless a substitute product is being proposed, in which case refer to Division 1, "Substitutions" section, for substitution requests.

Contractor's [Contractor is to acknowledge with initials each submittal included]
Initials:_____

_____ Letter of explanation attached for each submittal not included.

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE

- _____ 1. Submit manufacturer's product data for paint which confirms conformance with Section 84-3 of the Caltrans Standards.
- _____ 2. Submit record striping plan pursuant to Paragraph 1.05A of this Section, if applicable.
- _____ 3. Submit color sample for green paint.

END OF SECTION

SECTION 323113 - 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. Steel chain-link fabric, galvanized
 - 2. Steel framework, galvanized.
 - 3. Swinging gates: steel chain-link fabric and steel framework, galvanized.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place" for concrete post footings.
 - 2. Section 087100 "Door Hardware" for gate hardware not specified in this Section.
 - 3. Section 102426 "Post and Panel Signage" for required signage at swing gates.
 - 4. Section 323119 "Decorative Metal Fencing and Gates" for decorative metal gates and posts installed at chain link fencing.

1.3 STANDARD SPECIFICATIONS

- A. Construction materials and methods shall be in accordance with the *Standard Specifications for Public Works Construction, 2018 edition (SSPWC)*, published by Building News, Inc., except as modified or otherwise specified herein (hereinafter the Standard Specifications).
- B. In case of conflict between the Standard Specifications and the Project Specifications, the Project Specifications shall govern.

1.4 REFERENCE SPECIFICATIONS

- A. Materials shall conform to the applicable requirements of *American Society for Testing and Materials (ASTM) Standards and American National Standards Institute (ANSI) Standards*, latest editions.
- B. Materials shall conform to the applicable requirements of the *Chain Link Fence Manufacturer's Institute Product Manual* including:
 - 1. Standard Guide for Metallic-Coated Steel Chain Link Fence & Fabric.
 - 2. Industrial Steel Guide for Fence Rails, Posts, Gates, and Accessories.
- C. In case of conflict between the Standard Specifications and Reference Specifications, the Reference Specifications shall govern.
- D. In case of conflict between Reference Specifications and the Project Specifications, the more stringent provision shall govern, as determined by the Owner's Representative, Architect and Engineer.

1.5 REGULATORY REQUIREMENTS

- A. Construction shall comply with the *2019 California Code of Regulations, Title 24, Part 2 (the California Building Code)*.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Manufacturer's technical data and specifications.
 - 2. Installation instructions for fence, gates and accessories.
 - 3. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Fence and gate posts, rails, and fittings.
 - b. Chain-link fabric, reinforcements, and attachments.
 - c. Gates and hardware.
- B. Shop Drawings: For each type of fence and gate assembly.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include accessories, hardware, gate operation, and operational clearances.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For framework strength according to ASTM F1043, for tests performed by manufacturer and witnessed by a qualified testing agency.
- B. Sample Warranty: For special warranty.

1.8 RECORD DOCUMENTS

- A. Comply with requirements of Division 1, "Project Record Documents" Section, and following:
 - 1. Accurately record changes in construction from that called for on the Drawings and Specifications, including unexpected physical conditions and unmarked or inaccurately marked existing utilities, for Record Documents.

1.9 QUALITY ASSURANCE

- A. CONTRACTOR'S QUALIFICATIONS: Fencing contractor shall have a minimum of three years of demonstrated successful experience constructing institutional fencing for projects involving similar scope and materials to those indicated for this Project, and shall have successfully completed a minimum of five projects of similar size and scope.
- B. Comply with the material, fabrication and installation standards of the *Chain Link Fence Manufacturer's Institute*.
- C. Comply with applicable and specified ASTM standards.

1.10 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.
- B. ENGINEER'S APPROVAL: Obtain Structural Engineer's review and approval of post locations in structural slab before beginning installation.

1.11 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to comply with performance requirements.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Chain-link fence and gate frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to ASCE/SEI 7.
 - 1. Design Wind Load: As indicated on Drawings.
 - a. Minimum Post Size and Maximum Spacing: As indicated on Drawings and in accordance with CLFMI WLG 2445, based on mesh size and pattern specified.

2.2 STEEL 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 the Chain Link Fence Manufacturer's Institute Product Manual and requirements indicated below:
 - 1. Fabric Height: Shall be as called for on the DSA approved drawings and will be 48" or 72", nominal. The nominal height is the overall dimension between ends of the knuckles, with a tolerance of plus or minus 1-inch.
 - 2. Steel Wire for Fabric: Commercial quality steel wire:
 - a. Wire Diameter: 9 gauge (0.148" diameter) core.
 - b. Mesh Size: 2 inch, diamond pattern.
 - c. Zinc-Coated Fabric: Galvanizing conforming to ASTM A 392, Type II, Class 1, 1.2 oz./sq. ft. with zinc coating applied before weaving.
- B. Selvage: Fabric should be knuckled at both top and bottom edges. Twists are not permitted.

2.3 FENCE FRAMEWORK

- A. Posts and Rails: ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 or ASTM F 1083 based on the following:
1. Fence Height: As indicated on Drawings (72 inches maximum).
 2. Light-Industrial-Strength Material: Group IC-L:
 - a. Round Steel Pipe: Electric-resistance-welded pipe.
 - 1) Line Post: 1.90 inches in diameter minimum
 - 2) End, Corner, and Pull Posts: 2.375 inches in diameter minimum.
 - b. Rectangular Steel Tubes: Cold-rolled carbon steel to meet ASTM A500 cold-formed welded and seamless structural tubing.
 3. Horizontal Framework Members: Intermediate, top and bottom rails according to ASTM F 1043.
 4. Brace Rails: ASTM F 1043.
 5. Metallic Coating for Steel Framework:
 - a. Type A: Not less than minimum 2.0-oz./sq. ft. average zinc coating according to ASTM A 123/A 123M or 4.0-oz./sq. ft. zinc coating according to ASTM A 653/A 653M.

2.4 TENSION WIRE

- A. Metallic-Coated Steel Wire: 0.177-inch- diameter, marcelled tension wire according to ASTM A817 or ASTM A824, with the following metallic coating:
1. Type II: Zinc coated (galvanized) by hot-dip process, with the following minimum coating weight:
 - a. Matching chain-link fabric coating weight.
 2. Install tension wire horizontally at bottom of fence fabric.

2.5 SWING GATES

- A. General: ASTM F 900 for gate posts and single and double swing gate types.
1. Gate Leaf Width: 36 inches minimum or as indicated on Drawings.
 - a. Provide 32 inches minimum clear width at accessible pedestrian gates within the path of travel. Required clear opening width to be free of projections below 34 inches above finish grade. Between 34 and 80 inches above finish grades, projections to be limited to 4 inches maximum.
 - b. Maximum width for accessible pedestrian egress gates within the path of travel is 48 inches nominal.
 2. Framework Member Sizes and Strength: Based on gate fabric height of 72 inches or less.
- B. Pipe and Tubing:

1. Zinc-Coated Steel: ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framework.
2. Gate Posts:
 - a. Round tubular steel at double gates and non-accessible single gates.
 - b. Rectangular tubular steel at accessible single gates to accept gate hardware.
3. Gate Frames and Bracing:
 - a. Round tubular steel at double gates and non-accessible single gates.
 - b. Rectangular tubular steel at accessible single gates to accept gate hardware.
- C. Frame Corner Construction: Welded and 3/8-inch- diameter, adjustable truss rods for panels 60 inches or wider.
- D. Hardware at Service Gates (not in accessible path of travel):
 1. General: Hardware provided by gate manufacturer.
 2. Hinges: 180-degree outward swing.
 3. Latch: Permitting operation from both sides of gate with provision for padlocking accessible from both sides of gates.
 4. Padlock: As specified in Section 087100 "Door Hardware."
- E. Hardware at Accessible Pedestrian Gates (within accessible path of travel):
 1. General: Hardware specified in Section 087100 "Door Hardware."
 2. Provide solid, smooth surface a minimum 10 inches high by full width of gate at bottom on the push side.
 3. Lock:
 - a. Maximum 5 lbs unlatching force per CBC 11B-404.2.7 and 11B-309.4 for all hardware, including exit devices.
 - b. Unlatching of gate shall not require more than one operation.
 4. Exit Devices (if required): Hardware to comply with SFM Standard 12-10-3, Section 12-10-302:
 - a. Cross bars for exit devices shall extend across not less than half of the gate width.
 - b. Ends of cross bars shall be curved, guarded or otherwise designed to prevent catching on clothing during egress.
 5. Gate Operation: Maximum 5 lb force operation per CBC 11B-404.2.9.

2.6 FITTINGS

- A. Provide fittings according to ASTM F 626.
- B. Post Caps: Provide for each post.
- C. Rail and Brace Ends: For each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
 2. Rail Clamps: Line and corner boulevard clamps for connecting bottom rails to posts.
- E. Tension and Brace Bands: Pressed steel.
- F. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
- H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
 - a. Hot-Dip Galvanized Steel: 0.106-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.
- 2.7 GROUT
- 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.
- 2.8 CONCRETE FOR POSTHOLES
- A. Normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compression strength of 2500 psi, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and 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.

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.
- C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend 1 inch above grade; shape and smooth to shed water.
 - b. Posts Set into Holes in Concrete: Form or core drill holes not less than 5 inches deep 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 (End) 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 30 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 at 96 inches 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 midheight 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 F567, 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 top tension wire through post cap loops. 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 and Bottom Rails: Secure to posts with fittings.
- J. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- K. 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.
- L. 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.
- M. 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 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 323113

SECTION 323119 - 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 pedestrian gates.
- 3. Decorative steel swing gates at masonry mechanical enclosure.

B. Related Sections:

- 1. Section 033000 "Cast-in-Place Concrete" for post concrete fill.
- 2. Section 042000 "Unit Masonry."
- 3. Section 055000 "Metal Fabrications."
- 4. Section 087100 "Door Hardware."
- 5. Section 323113 "Chain Link Fences and Gates" for chain link fencing to receive decorative metal gates.

1.3 ACTION SUBMITTALS

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

- B. Shop Drawings: For gates.

- 1. Include plans, elevations, sections, and mounting and attachment details.

- C. Samples: For each fence material specified.

- 1. Provide Samples 12 inches square for sheet materials.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

PART 2 - PRODUCTS

2.1 DECORATIVE STEEL FENCES

- A. Decorative Steel Fences: Fences made from steel tubing[bars] and shapes, hot-dip galvanized.
- B. Posts: Square steel tubing.
 - 1. Line Posts: 2-1/2 by 2-1/2 inches with 1/4-inch wall thickness.
 - 2. End, Corner and Gate Posts: 4 by 4 inches with 1/4-inch wall thickness.
- C. Post Caps: Formed from steel sheet and hot-dip galvanized after forming.
- D. Rails:
 - 1. Steel Tube Rails: Square steel tubing 2-1/2 by 2-1/2 inches with 1/4-inch wall thickness.
- E. Pickets: 1 inch square by 0.065-inch steel tubes.
 - 1. Terminate tops of pickets at top rail for flush top appearance.
 - 2. Picket Spacing: As required to prevent 4 inch diameter sphere from passing between pickets.
- F. Infill:
 - 1. Perforated Metal Sheet: Uncoated steel sheet, perforated as indicated, 0.075-inch nominal thickness.
- G. Fasteners: Fully-welded construction.
- H. Fabrication: Assemble fences into sections by welding pickets to rails.
- I. Finish exposed welds to comply with NOMMA Guideline 1, Finish #4 - good-quality, uniform undressed weld with minimal splatter.
- J. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A123/A123M. For hardware items, hot-dip galvanize to comply with ASTM A153/A153M.
 - 1. Hot-dip galvanize posts.
 - 2. Hot-dip galvanize rail and picket assemblies after fabrication.
- K. Finish for Steel Items: Primed.
- L. Finish for Metallic-Coated-Steel Items: Galvanized finish.

2.2 ACCESSIBLE SWING GATES

- A. Gate Configuration: Single leaf.
- B. Gate Frame Height: As indicated.
- C. Gate Opening Width: As indicated.
 - 1. Minimum leaf size of 36 inches (32 inches minimum opening width).
 - 2. Maximum leaf size of 48 inches.
- D. Galvanized-Steel Frames:
 - 1. Stiles and Top Rails (unless indicated otherwise): Fabricate members from square tubes 2 by 2 inches formed from 0.125-inch nominal-thickness, metallic-coated steel sheet or formed from 0.125-inch nominal-thickness steel sheet and hot-dip galvanized after fabrication.
 - 2. Intermediate Stiles and Bottom Rails: Fabricate members from tubes 10 by 2 inches formed from 0.125-inch nominal-thickness, metallic-coated steel sheet or formed from 0.125-inch nominal-thickness steel sheet and hot-dip galvanized after fabrication.
- E. Frame Corner Construction: Welded.
- F. Infill:
 - 1. Perforated Metal Sheet: Uncoated steel sheet, perforated as indicated, 0.075-inch nominal thickness.
- G. Picket Size, Configuration, and Spacing (Where Occurs): Comply with requirements for adjacent fence.
- H. Accessible Hardware: As specified in Section 087100 "Door Hardware."
- I. Finish exposed welds to comply with NOMMA Guideline 1, Finish #4 - good-quality, uniform undressed weld with minimal splatter.
- J. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A123/A123M. For hardware items, hot-dip galvanize to comply with ASTM A153/A153M.
 - 1. Hot-dip galvanize gate assembly after fabrication.

2.3 SERVICE SWING GATES

- A. Gate Configuration: Double leaf.
- B. Gate Frame Height: 72 inches.
- C. Gate Opening Width: 72 inches.

- D. Galvanized-Steel Frames: Fabricate members from 3 by 3 by 3/16-inch steel angles, hot-dip galvanized after fabrication.
- E. Frame Corner Construction: Mitered and welded.
- F. Infill:
 - 1. Steel Decking: 18 gauge galvanized steel ribbed decking welded to angle frame.
 - 2. Deck Profile: As indicated.
- G. Hardware: As indicated on Drawings. Provide center gate stops and cane bolts for pairs of gates. Fabricate latches with integral eye openings for padlocking.
- H. Hinges: BHMA A156.1, Grade 1, suitable for exterior use.
 - 1. Function: 39 - Full surface, triple weight, antifriction bearing.
 - 2. Material: Wrought steel, forged steel, cast steel, or malleable iron; galvanized.
- I. Finish exposed welds to comply with NOMMA Guideline 1, Finish #4 - good-quality, uniform undressed weld with minimal splatter.
- J. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A123/A123M. For hardware items, hot-dip galvanize to comply with ASTM A153/A153M.
 - 1. Hot-dip galvanize gate assembly after fabrication.

2.4 STEEL AND IRON

- A. Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Bars (Pickets): Hot-rolled, carbon steel complying with ASTM A29/A29M, Grade 1010.
- C. Tubing: ASTM A500/A500M, cold-formed steel tubing.
- D. Uncoated Steel Sheet: Hot-rolled steel sheet, ASTM A1011/A1011M, Structural Steel, Grade 45 or cold-rolled steel sheet, ASTM A1008/A1008M, Structural Steel, Grade 50.
- E. Galvanized-Steel Sheet: ASTM A653/A653M, structural quality, Grade 50, with G90 coating.
- F. Castings: Either gray or malleable iron unless otherwise indicated.
 - 1. Gray Iron: ASTM A48/A48M, Class 30.
 - 2. Malleable Iron: ASTM A47/A47M.

2.5 COATING MATERIALS

- A. Shop Primers for Galvanized Steel: Provide primers that comply with Section 099100 "Painting."

2.6 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 033000 "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi, 3-inch slump, and 1-inch maximum aggregate size.
- C. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M and specifically recommended by manufacturer for exterior applications.

2.7 STEEL FINISHES

- A. Surface Preparation: Clean surfaces according to SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning." Or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."] After cleaning, apply a conversion coating compatible with the organic coating to be applied over it.
- B. Primer Application: Apply zinc-rich epoxy primer immediately after cleaning, to provide a minimum dry film thickness of 2 mils per applied coat, to surfaces that are exposed after assembly and installation, and to concealed surfaces.
- C. Shop-Primed Finish: Comply with Section 099100 "Painting."

2.8 METALLIC-COATED-STEEL FINISHES

- A. Galvanized Finish: Clean welds, mechanical connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.
- B. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a zinc-phosphate conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

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

3.2 PREPARATION

- A. 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 017300 "Execution."

3.3 DECORATIVE FENCE INSTALLATION

- A. Install fences by setting posts as indicated and fastening rails and infill panels to posts.
- B. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 24 inches plus 3 inches for each foot or fraction of a foot that fence height exceeds 4 feet.
- C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Top 2 inches above grade at landscape areas. 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.

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 and lubricate where necessary.

3.5 ADJUSTING

- A. 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 323119

SECTION 328400 - PLANTING IRRIGATION**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. Piping.
2. Encasement for piping.
3. Automatic control valves.
4. Miscellaneous piping specialties.
5. Sprinklers.
6. Quick couplers.
7. Controllers.
8. Boxes for automatic control valves.

- B. Related Sections:

1. Division 32 Section 329300 "Plants"

1.3 DEFINITIONS

- A. Circuit Piping: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.
- B. Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.
- C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.4 REFERENCES

- A. American Society for Testing and Materials (ASTM)

1. B88: Seamless Copper Water Tube
2. D2466: Polyvinyl Chloride (PVC) Plastic Pipe Fittings-Schedule 40

1.5 QUALITY ASSURANCES

A. Installer Qualifications

1. Provide at least one person who shall be present at all times during installation of Work, familiar with type of materials specified herein and material manufacturer's recommended method of installation and direct Work performed in this Section. Coordinate Work with General Contractor.

B. Fees, Codes and Standards

1. Pay applicable fees for State Test of Backflow Prevention Devices.
2. Comply with State, County and Municipal codes and regulations including the reclaimed water cross connection compliance.

C. Plastic Pipe

1. Provide manufacturer's guarantee that plastic pipe has passed or is capable of passing the Acetone Immersion Test and is free from manufacturing defects.

D. Drawings

1. Due to scale of drawings, it is not always possible to indicate all offsets, fittings and sleeves, which may be required. Investigate structural and finished conditions affecting Work. Install Work to avoid conflicts between plantings, other site utilities and architectural features.

1.6 SUBMITTALS

A. Materials List

1. Within thirty (30) days from date of Notice to Proceed and before materials are delivered to job site, submit two (2) complete lists of materials.
 - a. Furnish manufacturer's name, catalog number, complete catalog cut, technical data and manufacturer's recommendations for installation and operation.
2. Do not permit materials to be installed until reviewed by Landscape Architect.

B. Record Drawings

1. Record changes made during installation. Dimension from two permanent points of reference such as building corners, sidewalks and road intersections, the location of the following:
 - a. Point of connection
 - b. Electrical connections
 - c. Gate valves
 - d. Routing of main line and control wires
 - e. Control valves and quick coupling valves

- f. Other related equipment
- g. Depth of pipe of different than specified

- 2. Transfer Record Data to new, clean prints of irrigation system and submit two (2) copies to Owner.

C. Controller Charts

- 1. Provide one (1) controller chart per controller.
- 2. Show area controlled by automatic controller. Provide chart of maximum size controller will allow.
- 3. Reduce Record Drawings for chart except when controller sequence is illegible after reduction; then enlarge to a readable size.
- 4. Use different colors to highlight coverage of stations.
- 5. Seal completed reduction of Record Drawing between 10 mil plastic laminate.

D. Manuals

Furnish two (2) sets of service manuals to Landscape Architect. Include manufacturer's catalogue numbers, price lists, local source, address and phone number, manufacturer's address and operating instructions for equipment installed.

E. Tools and Equipment

Furnish:

- 1. Two (2) sets of special tools required for removing, disassembling and adjusting sprinklers and valves installed.
- 2. Two (2) keys for automatic controllers installed.
- 3. One (1) quick coupler key and matching hose swivel for every five (or fraction) of quick coupler valves installed.

1.7 DELIVERY, STORAGE AND REPLACEMENT

- A. Deliver to job site and provide safe storage. Coordinate with General Contractor.
- B. Protect materials from vandalism and other trades.
- C. In event of damage, make repairs and replacements within seven (7) days at no cost to Owner. Review damage and method of repair with Landscape Architect.

1.8 GUARANTEE

A. Guarantee for One Year from Final Acceptance

- 1. Materials are new and free from defects.
- 2. Against defects of materials and workmanship and damage caused by defects.
- 3. To make required replacements with new materials and correct damage caused by defects at no cost to Owner.
- 4. Complete coverage of areas indicated to be irrigated on drawings including minor adjustments required by field conditions.

B. Guarantee

1. On company letterhead, type following information and submit two (2) copies with original signatures to Landscape Architect:

GUARANTEE FOR IRRIGATION SYSTEM

We hereby guarantee that the irrigation system we have furnished and installed is free from defects in materials and workmanship and the Work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse of neglect excepted. We agree to repair or replace defects in materials and Workmanship including damages consequential to defects in materials and workmanship and repair or replacements, which develop during on (1) year after Final Acceptance of the Work, at no additional cost to the Owner. We agree to make such repairs and replacements within thirty (30) days of written notice. In the event of our failure to make such repairs and replacements within thirty (30) days of written notice, we authorize the Owner to proceed to have such repairs and replacements made at our expense and we will pay all costs and charges upon demand:

Project:

Location:

Date of Final Acceptance:

Signed:

Company Name:

Address:

PART II – PRODUCTS

2.1 MANUFACTURERS

- A. Provide products of manufacturers indicated on drawings or equivalent.

2.2 PIPE AND TUBING

- A. Copper: ASTM B88, Type L, hard-drawn copper tube and wrought solder type.

B. Plastic Pipe

1. Polyvinyl chloride (PVC), new and unused; no more than 15 percent less than full manufactured length.
2. Continuously and permanently marked plastic pipe with following information:
 - a. Manufacturer's name
 - b. Pipe size
 - c. IPS size (schedule number)
 - d. Type of material
 - e. Code number

3. Non-pressure lateral lines, Schedule 40, bearing National Sanitation Foundation (NSF) seal, except as otherwise indicated on drawings.
4. Pressure lines, 1/2" through 1-1/2", Schedule 40, bearing NSF seal.
5. Pressure lines, 2" and larger, Schedule 80.
6. Sleeves for lines under paving as shown on drawings, schedule 40.
7. Mainline Piping under paving, Schedule 40.
- 8.. Fittings for pipe, Schedule 40 polyvinyl chloride, Type 1-11, bearing NSF seal and complying with requirements of ASTM D2466.
9. For joining, use solvent, complying with requirements of ASTM D2466 and recommended by manufacturer of plastic pipe used.

2.3 BRASS PIPE FITTINGS

- A. Furnish as indicated on drawings.

2.4 SPRINKLER HEADS

- A. Furnish as indicated on drawings.

2.5 VALVES

- A. Ball valves: manufactured by Spears, PVC threaded utility ball valves of size required for line indicated on the drawing. Install as detailed.
- B. Quick couplers: as detailed on drawings.
- C. Check valves: as shown on drawings.
- D. Gate valves: Provide and install as detailed.
- E. Valves will be installed with schedule 80 isolation valve and threaded schedule 80 unions on both sides.

2.6 VALVE BOXES

- A. Concrete traffic rated valve box set on brick perimeter. Install as detailed. One valve per box. Valve box wide enough to access both unions and valve.
- B. Group valves in one location as shown. Do not locate valve boxes in high traffic areas. Do not bury valve boxes

2.7 OTHER MATERIALS

- A. Provide other materials, not described but required to complete installation, which are new and unused, Review these materials with Landscape Architect.

PART III - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to work of this Section, carefully inspect installed work of other trades and verify that such work is complete to point where this installation may properly commence.
2. Verify that irrigation system may be installed in strict accordance with pertinent codes and regulations, the original design, the referenced standards, and manufacturer's recommendations.

B. Discrepancies

1. In event of discrepancy between drawings and actual conditions, immediately notify Landscape Architect.
2. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

3.2 PREPARATION

A. Field Measurements: Scaled dimensions are approximate; verify, Make necessary measurements in field to ensure precise fit of items in accordance with original design.

B. Preparation: Locate underground utilities and protect. Remove rock or other such obstructions or avoid. Repair existing utilities if damaged at no additional cost to Owner.

3.3 TRENCHING

A. Trench with mechanical trencher or by hand. Notify owner if rock is encountered that cannot be removed in the aforementioned manners.

B. No wider than necessary to lay pipe.

C. Straight with vertical sides and level bottoms.

D. Remove rocks, debris, and sharp objects.

3.4 INSTALLATION OF PIPING

A. General

1. Lay out piping system in accordance with the Irrigation Plan, while recognizing diagrammatic nature of drawings.
2. Where piping is shown on drawing to be under paved areas by running parallel and adjacent to planted areas, intention is to install the piping in planted areas.
3. Do not install a line parallel to and directly over another line. Minimum 6" horizontal clearance between irrigation pipes.

4. Allow minimum horizontal clearance of 12" from lines of other trades.
 5. Install piping to the sides of planters to allow for tree planting in the middle.
- B. Piping Depth: Install piping with at least the following depth:
- | | |
|--|--------------------|
| Pressure Lines: | 18 inches of cover |
| Sprinkler Laterals: | 12 inches of cover |
| Pressure lines and sprinkler
Laterals under roadways, walks
or other paving: | 24 inches of cover |
- C. Piping under Paving
1. Pipe under new walks and paving shall be laid prior to installation of paving or walks in sleeves. Contractor to coordinate with other trades.
 2. Pipe under existing concrete walks shall be installed by jetting or boring.
 3. Where cutting or breaking of existing pavement is necessary, secure permission from Owner before cutting or breaking pavement and then make necessary repairs and replacements to approval of the owner at no additional cost to Owner.
- D. Inspection of Pipe and Fittings: Carefully inspect pipe and fittings before installation, removing dirt, scale, and burrs and reaming as required; install pipe with markings up for visual inspection and verification.
- E. Plastic Pipe
1. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings.
 2. Store plastic pipe and fittings under cover until ready to install.
 3. Transport plastic pipe only on a vehicle with a bed long enough to allow pipe to lay flat to avoid undue bending and concentrated external load.
 4. Cut accurately in padded vise, Square ends.
 5. Repair dented and damaged pipe by cutting out damaged section and rejoining with a coupling.
 6. In jointing, use only the specified solvent and make joints in strict accordance with manufacturer's recommended methods; give solvent welds at least 15 minutes set-up time before moving or handling and 24 hours curing time before filling with water.
 7. Center load plastic pipe with a small amount of backfill to prevent arching and whipping under pressure.
 8. Install approved dielectric couplings, unions, or fittings wherever two dissimilar metals are connected.
 9. Use continuous tracer wire for all main lines (i.e. no wire nuts)

3.5 INSTALLATION OF EQUIPMENT

- A. Quick Couplers: Furnish and install as detailed.

B. Sprinkler Heads

1. Install sprinkler heads where indicated on drawings and in strict accordance with manufacturer's recommendations and details.
2. Align part-circle heads so that no spray hits building wall or windows, and that spray be in proper relation to adjacent paving, headers, or curbs as detailed.
3. Adjust spray nozzles so that there will be a minimum amount of overspray, and so that entire set will be as evenly balanced as possible.

C. Valves: Furnish and install in locations shown on plan according to details.**D. Valve Boxes: Furnish and install as detailed.****E. Control wires**

1. Install according to manufacturer's directions.
2. Tape wire together minimum 12'-0" O.C. Do not tape to side of pressure pipe.
3. Encase in plastic conduit wire passing under future or existing paving, construction, etc., extending conduit at least 12" beyond edges of the paving or construction.
4. Install control wires in common trench with pressure line wherever possible.
5. Provide looped slack at valves and snake wires in trench to allow for contraction.
6. Control wire splices allowed only on runs more than 500 feet. Splice with Scotch-Lok. Install splices in 6" to 10" diameter valve box.
7. All valve wire to be ear tagged on pilot wire at valve location

3.6 BACKFILLING

Backfill only after review by Landscape Architect. Backfill in the cool of the day; backfill with fine materials free of rocks or sharp objects tamped to 85% compaction; 90% under paving. Leave grade flush and smooth.

3.7 MAINTENANCE

Continuously maintain involved areas of contract during progress of work and during Maintenance Period of contract. Work includes: raising and lowering of heads to compensate for lawn growth and mulch, cleaning and adjustment of heads.

3.8 TESTING AND OBSERVATION**A. Forty Eight (48) hour notice required by Landscape Architect for observations.****B. Closing in Work**

Do not allow or cause work of this Section to be covered up or enclosed until it has been reviewed by Landscape Architect.

C. Flushing

Before backfilling main line, and with all control valves in place, but before lateral pipes are connected, completely flush and test main line and repair leaks.

1. Flush out each section of lateral pipe before sprinkler heads are attached.

D. Testing

1. Make necessary provisions for thoroughly bleeding line of air and debris.
2. Before testing, fill line with water for a period of at least 24 hours.
3. After valves have been installed, test pressure lines with fittings exposed for two hours at 125 pounds pressure with gauge on pump, in presence of Landscape Architect.
4. Coverage Test in presence of Landscape Architect: adjust valves and align sprinkler heads. Should it be determined by Landscape architect that adjustments of irrigation equipment would provide more adequate coverage, make necessary arrangements to have adjustments accomplished prior to planting, this includes changes of nozzles and addition or deletion of sprinklers. Do not commence planting operations until entire irrigation system operates properly.

E. Final Review

1. Thoroughly clean, adjust, and balance all systems.
2. Demonstrate entire system to Landscape Architect proving that remote control valves are properly balanced, that heads are properly adjusted for radius and area of coverage, and that the installed system is workable, clean, and efficient.
3. Final Acceptance will be given only when the plantings and irrigation system are acceptable, and when signed Guarantee and valve keys have been delivered to Owner.
4. 72 hours notice required for Final Review.

END OF SECTION 328400

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SECTION 329300 - PLANTS

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. Plants.
- 2. Planting soils.
- 3. Tree stabilization.
- 4. Landscape edgings.
- 5. Tests- Soils Management Report

B. Related Sections:

- 1. Division 32 Section 328400 "Planting Irrigation" for plant irrigation.

1.3 QUALITY ASSURANCE

A. Source Quality

- 1. Provide plant materials conforming to State of California grading code of Nursery Stock, No. 1 grade, for quality and size. Use only nursery-grown stock.
- 2. Plants: Subject to review by Landscape Architect at place of growth or storage yard and upon delivery for conformity to specifications. Such review shall not preclude right to review and of rejection during progress of work.
- 3. Nomenclature: Per An Annotated Checklist of Woody Ornamental Plants of California, Oregon & Washington, Division of Agricultural Sciences, University of California publication 4091.

B. Requirements of Regulatory Agencies

- 1. Perform work in accordance with all laws, codes and regulations required by authorities in furnishing, transporting and installing materials.
- 2. Certificates of inspection required by law for transportation shall accompany invoice for each shipment of plants. File copies of certificate with Landscape Architect after review of material.

C. Continuous Superintendence

1. Have one person responsible for work specified in this section continuously on job site throughout installation.

1.4 SUBMITTALS

A. Samples

1. Soil amendments with analysis prior to materials being brought on job site.
2. Existing topsoil: representative samples from several locations of job site.
3. Submit photos of plants 15 gallons and larger, from other than local nurseries, with person standing next to trees for scale. Label photo with following information:
 - a. Botanical and Common Name
 - b. Name, Location, and Phone Number of Nursery
 - c. Size of Container
 - d. Trunk Height to Lowest Branching
 - e. Caliper at 3'-0" from ground

B. Invoices

1. Copies of invoices for soil amendments, fertilizers and materials specified herein. Invoice shall contain job site name, job site address, contractor's name, materials delivered, quantities delivered and date.

C. Soil Testing

1. Imported fill: provide soil analysis from composites of borrow area prior to delivery on job site.
2. Existing soil: provide soil analysis of representative samples from 3 locations of job site, as determined by Landscape Architect. The soil samples are to be sent to Wallace Laboratories, 365 Coral Circle, El Segundo, CA 90245. Tel.310-615-0116 The samples are to be from 12-18" deep at 3 locations and a 'Soils Management Report' is to be generated that determines agricultural suitability, soils texture, soils organic matter, and calculated rate of percolation. This report will determine how plants will be amended and drained.
3. Imported topsoil: perform test on separate sources prior to delivery on job site. Identify source location, percentages of silt, clay, sand, organic matter, pH, mineral and plant nutrient content of soil. Soils unsuitable for planting shall be rejected.

4. Provide soil analysis expressed in parts per million including the following:

a.	Organic Content	i.	Zinc
b.	Nitrogen	j.	Manganese
c.	Phosphorous	k.	Copper
d.	Potassium	l.	Iron
e.	Magnesium	m.	Boron
f.	Calcium	n.	pH
g.	Sodium	o.	ECe
h.	Sulfur		

Analysis: performed by certified testing laboratory. Wallace Labs or Equal facility. Soils deemed unsuitable for planting shall be rejected.

5. Suitability of soil and chemical deficiencies shall be determined by Landscape Architect. Deliver test results to Landscape Architect.
6. Soil under previous building or parking areas: test at surface and six inches below grade by germinating radishes or annual rye grass. If germination fails, remove sterilized soil and place topsoil.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Furnish standard products in manufacturer's containers bearing original labels showing quantity, analysis and name of manufacturer.
- B. Deliver plants in closed trucks or wrap specimens to prevent windburn. Wind burned plants will be rejected.
- C. Provide protection for plants and products from weather conditions or other adverse conditions.
- D. Deliver plants with legible identification labels. Label trees, bundles of containers of like shrubs, and groundcover plants. Use durable waterproof labels with water-resistant ink which will remain legible for at least sixty (60) days.
- E. Lift plants by container only. Plants with broken limbs, loose root balls, or loose trunks will be rejected.
- F. Provide 24-hour notification of delivery schedule in advance so material may be reviewed upon arrival at job site. Remove unacceptable material from the job site immediately.
- G. Deliver pesticides and soil fumigants to job site in original unopened containers. Containers that do not have legible label that identifies Environmental Protection Agency and State registration number, and manufacturer's registered uses shall be rejected. Poison may be used only with Owner's approval.
- H. Do not store soil sterilant and pesticides with any other landscape materials. Store in locked separate structure or vehicle.

1.6 JOB CONDITIONS

- A. Existing conditions: base bids on following conditions:
 - 1. That existing ground elevations will be brought to elevations indicated on grading plan.
 - 2. That no pipes or artificial obstructions, other than those indicated will be encountered, notify Landscape Architect if unforeseen obstructions are encountered.
- B. Coordination

Coordinate and cooperate with other Contractors to enable work to proceed as rapidly and efficiently as possible.
- C. Cleanup
 - 1. Keep areas clean, neat and orderly.
 - 2. Broom clean paved surfaces. Do NOT wash or hose down paved areas.
 - 3. Remove all deleterious materials and debris prior to Maintenance Period.

1.7 SUBSTITUTIONS

- A. May be allowed if notified within four (4) weeks after contract award that specified plants are unavailable. Request substitutions with price adjustment quotes, in writing, along with proof plants are unavailable.
- B. Replace with same kind and sizes as originally planted, at no cost to Owner. Provide one (1) year guarantee on replacement. Protect irrigation system and other piping, conduit or other work during replacement. Repair damage immediately at no cost to Owner.
- C. Excludes replacement of plants because of injury by storm, natural drought, hail, insects or diseases.

1.8 GUARANTEE

- A. Plants 15 gallons and larger for one (1) year after Final Acceptance. Replace dead plants and plants not in vigorous, thriving condition as soon as weather permits and on notification by Landscape Architect. Replace plants which have partially died, thereby damaging shape, size or symmetry.
- B. Replace with same kind and sizes as originally planted, at no cost to Owner. Provide one (1) year guarantee on replacement. Protect irrigation system and other piping, conduit or other work during replacement. Repair damage immediately at no cost to Owner.
- C. Excludes replacement of plants because of injury by storm, natural drought, hail, insects or diseases.

D. Guarantee

1. On company letterhead, type following information and submit two (2) copies with original signatures to Landscape Architect:

GUARANTEE FOR PLANTING SYSTEM

We hereby guarantee that the planting system we have furnished and installed is free from defects in materials and workmanship and the work has been completed in accordance with the drawing and specifications, ordinary wear and tear and unusual abuse or neglect excepted. We agree to repair or replace defects in materials and Workmanship including damages consequential to defects in materials and workmanship and repair or replacement, which develop during one (1) year after Final Acceptance of the Work, at no additional cost to the Owner. We agree to make such repairs and replacements within thirty (30) days after receipt of written notice. In the event of our failure to make such repairs and replacements within thirty (30) days of written notice, we authorize the Owner to proceed to have such repairs and replacements made at our expense and we will pay all costs and charges upon demand.

Project:

Location:

Date of Final Acceptance:

Signed:

Company Name:

Address:

PART II – PRODUCTS

2.1 PLANTS

- A. Provide healthy and vigorous, well-branched and densely foliated plants when in leaf; free of disease, insect pests, eggs or larvae; with healthy, well-developed root systems; and free from physical damage or adverse conditions that would prevent thriving growth.
- B. Provide plants true to species and variety and conforming to measurements specified. Provide standard sized plants.
- C. Provide container stock grown for at least six (6) months, but not over two (2) years in containers in which they are delivered. Cracked or broken root balls shall not be planted.
- D. If a plant species is not available, Landscape Architect will select substitute. (Refer to 1.06 Substitutions.)
- E. Do not prune prior to delivery.
- F. Match in size plants of same species in rows.

- G. Do not use root-bound, sunburned, or wind-tattered plants. Several plants of each species shall be uncanned and checked for root growth. In event that sample plant reviewed are found to be defective, entire lot or lots of plants represented by defective samples may be rejected. Such plants shall be replaced with new plants conforming to the requirements of this section at no cost to Owner.
- H. In event of disagreement as to condition of root system, root conditions of furnished plants will be determined by removal of earth from roots on not less than two plants or more than 2 percent of total number of plants of each species or variety. Where plants are from several sources, roots of not less than two plants of each species or variety from each source will be reviewed. If sample plants are defective, entire lot or lots of plants may be rejected. Plants rendered unsuitable for planting due to this inspection will be considered samples and provided at no cost to Owner.
- I. Guarantee that plants are species called out on plan. Should it be determined by Landscape Architect within one year of Final Acceptance that incorrect species were installed, replace with correct species at no additional cost to Owner. Install replacement plants one container size larger than called out on plans, to compensate for lost growing time.

2.2 TOPSOIL

- A. Natural, fertile, friable, sandy loam, characteristic of productive soils in the vicinity, 6.5 to 8.0 pH.
- B. Free of weeds, seeds, Bermuda and kikuya grass stolons, subsoil, clay lumps, stones, roots, sticks, substances 1-1/2" or more in diameter and debris.
- C. Do not deliver or spread while in muddy condition.
- D. Fill planters with topsoil

2.3 FERTILIZER AND SUPPLEMENTS

- A. Gro-Power Plus, 5-3-1, manufactured by Southern California Organic Fertilizer Company,
- B. Containers and Planters; Gro-Power Plus controlled release nitrogen, 12-8-8 manufactured by Southern California Organic Fertilizer Company.
- C. Pre-sod Fertilizer: 16-20-8 commercial fertilizer.
- D. "Liquinox-start" or equivalent vitamin B-1 supplement for all trees and shrubs 5-gallon and larger.

2.4 SOIL AMENDMENTS

- A. Pre-emergents: may not be used without Owner's approval.
- B. Bone meal: standard horticultural brand.

- C. Gypsum: Agricultural grade; minimum 98 percent calcium sulphate.
- D. Nitrogen-fortified shavings: redwood, fir or cedar with minimum 0.40 percent nitrogen based on dry weight. Provide one of following: "Forest Humus" or Nitrogen-fortified Redwood Shavings.

2.5 PREPARED BACKFILL MIX

- A. Prepare as follows for trees and shrubs:
 - 2 parts topsoil or existing topsoil
 - 2 part nitrogen-fortified shavings
 - 25 lbs. Gro-Power Plus per cubic yard of backfill

2.6 PESTICIDES

- A. Do not use pesticides containing chlorinated hydrocarbons (DDT, Chlordane, Lindane) or organic phosphates (Parathion) or paraquat.
- B. Permission to use any type of pesticides must be obtained from District Superintendent.

2.7 MULCH

- A. Provide shredded wood chippings or approved alternate in all shrub areas where indicated on plans. Submit sample to Landscape Architect for review.
- B. Provide 2-4" Noiyo Cobble Stone as indicated on plans. Planters with rock need to have a finish grade 5" below surrounding areas to ensure rock stays in.

2.8 GUYING AND STAKING MATERIALS

- A. Rough sawn redwood, 2x2x8, construction grade or Lodge Pole pine, fully treated with Coppernapthanate Wood Preservative, 2-inch (minimal nominal size) diameter by 8 feet long, no split stakes.
- B. Guy Anchor: provide 1" diameter galvanized steel pipe with plastic end cap.
- C. Guying Hardware: wire-pliable 12-gauge galvanized; hose ½-inch rubber; turnbuckles – galvanized or dip painted size as required; cable clamps – galvanized, size as required; safety sleeve – 1.2 inch white PVC full length of wire.
- E. Staking Materials: Wire-pliable, 12-gauge galvanized; hose ½-inch rubber, nylon reinforced plastic straps in figure 8 super tree tie.

2.9 LANDSCAPE FABRIC

- A. Landscape fabric is required in all planters.
- B. 500 series Landscaper's Choice Woven Landscape Fabric or equal.

2.10 PLANTERS

Use topsoil in planters along with prepared backfill mix (section 2.5)

PART III – EXECUTION

3.1 MEASUREMENT

- A. Scaled dimensions are approximate: verify.
- B. Inform Landscape Architect of discrepancies between drawings and field conditions.
- C. Using a transit, verify that landscape areas can be graded to drain per code. If this cannot be accomplished, notify the Landscape Architect in writing.

3.2 FINISH GRADING

- A. Provide positive surface drainage of planted areas. Inform Landscape Architect of discrepancies between drawing, specifications and field conditions which preclude establishing positive drainage.
- B. Prior to soil preparation, remove all rocks over 1-1/2" in diameter, sticks, plaster, concrete, debris and foreign growth from planting areas.
- C. Prior to planting, remove existing Bermuda or Kikuyu grass. Poison may only be used with express permission of the School District and in accordance with spray manufacturer's instructions. If approved, this must be done during the warm season, April – September.
- D. Establish finish grade in planting areas after soil preparation, settlement and planting as shown on drawings. Drain planting areas away from buildings at a minimum of 2% for the first 5 feet. Grade against building shall be a minimum of 6" below the bottom of wood siding or sills if applicable.
- E. Establish finish grade at planter areas bordering curbs, headers, and walks 4" below flatwork. Remove or add topsoil as necessary to establish finish grade.

3.3 SOIL PREPARATION

- A. Step 1 - Subsoil
 - 1. Cultivate to depth of 9".
 - 2. Apply gypsum at rate of 150 lbs. per 1000 square feet. Do not cultivate.
 - 3. Water to leach gypsum through top 9" of soil.
 - 4. Keep moist for 10 days to germinate weed seeds.
 - 5. Remove weeds. Small annual weeds may be cultivated in.

- B. Step 2 –
1. Apply 4 cubic yards of Nitrogen-fortified wood shavings and 150 lbs of Gro Power Plus per 1000 square feet. Cultivate to a depth of 6".
 2. Supplement with imported topsoil in areas where existing soil is insufficient.

3.4 TREE AND SHRUB PLANTING

- A. Prior to excavating pits, place trees and shrubs as shown on drawings. Request review by Landscape Architect.
- B. Excavate pits twice diameter of container and 6" greater in depth. Dispose of unsuitable material encountered.
- C. Broadcast bone meal over bottom of pit at following rates:
- | | |
|-----------------|-------------------|
| Boxed Plants | 1 cup/foot of box |
| 15-gallon Plant | 1 cup |
| 5-gallon Plant | ½ cup |
| 1-gallon Plant | ¼ cup |
- D. Add backfill mix to pit and tamp to compact.
- E. Center plants in pits and fill pits with backfill mix. Set plants so top of root ball is level with finish grade when settled.
- F. Add 'Liquinox-Start' to 5-gallon and larger shrubs and trees after planting at the rate of 1 tablespoon per gallon of water. Apply at following rates:
- | | |
|------------------|-----------------------|
| Boxed Plants | 2 gallons/foot of box |
| 15-gallon Plants | 3 gallons |
| 5-gallon Plants | 1 gallons |
- G. Stake or guy trees immediately after planting. Windblown or broken trees not properly staked or guyed will be rejected. Details are general, adjust to fit individual trees.
- H. Pruning: remove dead branches and weak crotches. Thin excessively dense trees as determined by Landscape Architect.
- J. Cleanup: rake smooth shrub areas and remove debris.

3.5 MULCH

- A. Use where shown on plans
- B. Shrub areas: rake basins smooth. Apply 2" layer of shredded bark or Noiyo rock as indicated on plans. Submit sample to Landscape Architect.
- C. Keep all mulches a minimum 2" away from plant stems. If soil stays too wet, uncover root balls.

3.6 TURF

See San Luis Obispo High School's turf specifications for rehabilitating field turf damaged by construction.

3.7 PROTECTION AND CLEANUP

- A. Dispose of empty containers off site at end of each day.
- B. Broom clean paved areas. Do NOT wash down walks.
- C. Clean walks, walls, and windows muddied by planting operations.
- D. Provide traffic barriers as required to protect newly planted areas.

3.8 REVIEW/OBSERVATION

- A. Request review at least 2 days prior to anticipated review date.
- B. Required review observations by Landscape Architect:
 - 3. Plant locations marked with flags prior to irrigation bubbler layout.
 - 4. Fine grading of all areas prior to planting.
 - 5. Plants: within 24 hours of delivery for conformity to specifications.
 - 6. Prior to planting with plants arranged per drawings.
 - 7. At each review, a punch list will be generated by the Landscape Architect. Prior to the next review date, punch list items shall be completed. Failure to comply with the execution of the punch list may result in re-doing of areas to correct problems.
- C. Final Review prior to starting Maintenance Period.
 - 1. When installation and punch list items are complete.
- D. Maintenance Period Reviews
 - 1. Thirty (30) days into Maintenance Period.
 - 2. Sixty (60) days into Maintenance Period
 - 3. Ninety (90) days into Maintenance
 - 4. Other times as may be required.
 - 5. At each review, a punch list will be generated by the Landscape Architect. Items on the punch list shall be completed before the next review. Failure to comply, may result in extension of the 90-day Maintenance period. Example: if punch list from Final Review is not completed for 30-day walkthrough, Maintenance Period will be extended 30 days.
- E. Review for FINAL ACCEPTANCE

1. At the 90 day review if the job is acceptable to Landscape Architect and Owner.
2. If unacceptable at the 90 day review, another time will be scheduled.

3.9 MAINTENANCE PERIOD

- A. Continuously maintain plants after installation until Final Acceptance.
- B. Maintenance Period: 90 days from completion of all punch list items from the Final Review.
- C. Maintenance Schedules
 1. Groundcover and Shrub Beds
 - a. Weeding: remove weeds and foreign grasses at least once a week.
 - b. Cultivating: as required to keep soil surface loose.
 - c. Replenish mulches to full depth after cultivation.
 2. Trees
 - a. Raise trees that settle below grade to established elevation.
 - b. Adjust stakes and guys to keep trees upright, erect and compensate for growth.
 - c. Remove weeds and foreign grasses from basins.
 3. General
 - a. Pruning: prune dead or broken branches from trees and shrubs.
 - b. Grade Adjustments: fill to original grade areas that have settled or eroded around trees and shrubs.
 - c. Notify Owner of each maintenance trip.
- D. Poison or trap gophers or ground squirrels and repair damage within seven (7) days of notification. Permission required from School District for poison.
- E. Replace dead, stolen, vandalized, damaged, frozen or dying plants within seven (7) days of notice. Assume a 10% replacement of plants 5 gallons and smaller due to theft and vandalism. 15 gallon and larger are guaranteed for 90 day maintenance regardless of cause.
- F. Adjust sprinkler heads in each area and zone of exposure so that optimum amount of water is applied according to capabilities of equipment and system.
- G. Replenish mulch to original depth in shrub and groundcover areas prior to end of maintenance.

3.10 REPAIR AND REPLACEMENTS

- A. Repair and/or replace damaged property and improvements due to actions of employees or failure of employees to act.
- B. Replace unacceptable plants with same species, size and guarantee as specified in this Section.

3.11 FINAL ACCEPTANCE

- A. Final acceptance of project will be given by Landscape Architect upon completion of work, punch list items and Maintenance Period excluding replacement of plants under Guarantee Period. Upon Final Acceptance, owner will assume maintenance of work.
- B. If the installation is phased, Final Acceptance may be given on an area basis at different times.
- C. If the Contractor waits until the end of maintenance to re-plant bare lawn, groundcover, etc. the Final Acceptance for a portion or all of the project may be continued until the newly planted areas are as established as originally planted areas.

END OF SECTION 329300

SECTION 330000 - SANITARY SEWERAGE PIPING AND EQUIPMENT**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Provide materials, equipment and transportation and perform labor as required to:
 - 1. Make exploratory investigations, excavations and surveys as necessary to ascertain locations and physical characteristics of existing buried pipelines, conduits and structures within work area prior to ordering materials or scheduling work and
 - 2. Construct sanitary sewerage piping improvements between designated points of connection with existing facilities and to designated points of connection with piping stubbed from building or
 - 3. Repair or relocate existing buried site utilities encountered during construction of other site improvements.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 31 20 00: Site Grading
- B. Section 31 23 00: Trenching and Backfilling
- C. Section 31 25 00: Construction Storm Water Pollution Prevention

1.4 STANDARD SPECIFICATIONS

- A. Construction materials and methods shall be in accordance with the *Standard Specifications for Public Works Construction*, 2015 edition (SSPWC), published by Building News, Inc., except as modified or otherwise specified herein (hereinafter the Standard Specifications).
- B. In case of conflict between the Standard Specifications and the project specifications, the project specifications shall govern.

1.5 REFERENCE SPECIFICATIONS / REFERENCE DETAILS

- A. Materials shall conform to the applicable requirements of *American Society for Testing and Materials (ASTM) Standards*, *American Water Works Association (AWWA) Standards* and *American National Standards Institute (ANSI) Standards*, latest editions.

- B. Polyvinyl chloride (PVC) pipe construction shall be in accordance with the *Handbook of PVC Pipe*, latest edition, published by the Uni-Bell Plastic Pipe Association.
- C. High Density Polyethylene Pipe (HDPE) Shall meet applicable requirements of ASTM F14.
- D. Ductile Iron Pipe (D.I.P.) pipeline construction shall be in accordance with the *Handbook of Ductile Iron Pipe*, latest edition, published by the Ductile Iron pipe Research Association.
- E. Where called for on the Drawings or in these Specifications, construction materials and methods shall be in accordance with the *County Public Works Department (Transportation Division) Standard Details*, September 2011 update, which include by reference the current versions of *Standard Specifications* and *Standard Plans* of the *California Department of Transportation (Caltrans)*.
- F. In case of conflict between the Standard Specifications and Reference Specifications, the Reference Specifications shall govern.
- G. In case of conflict between Reference Specifications and the Project Specifications, the more stringent provision shall govern, as determined by the Owner's Representative and the Engineer.

1.6 REGULATORY REQUIREMENTS

- A. Construction shall comply with the *California Code of Regulations, Title 24, Part 2 (the California Building Code)*, most recent effective edition.

1.7 SUBMITTALS

- A. Provide submittals according to the Conditions of the Contract and Division 1 "Submittal Procedures" section.
- B. Refer to "Submittal Requirements and Schedule" at the end of this Section.

1.8 RECORD DOCUMENTS

- A. Comply with requirements of Division 1, "Project Record Documents" section, and the following:
 - 1. Accurately record results of exploratory investigations regarding locations and characteristics of existing buried pipelines and conduits.
 - 2. Accurately record locations of constructed pipelines, fittings, valves, connections and appurtenant structures, including depth below finish grade to waterlines and invert elevations of sewer.
 - 3. Accurately record changes from construction identified on Drawings and Specifications, including unexpected physical conditions and unmarked or inaccurately marked existing utilities.

PART 2 - MATERIALS

2.1 ON-SITE SANITARY SEWER

B. SEWER PIPE AND FITTINGS, PVC, 4 inches AND LARGER

1. Unless otherwise called for on the Drawings, sewer pipe and fittings shall be Type PSM Polyvinyl Chloride (PVC) with integrally molded bell and spigot for gasketed joint assembly, meeting requirements of the most recent issue of ASTM Standard D-3034 (SDR 35).
2. Joints shall comply with the most recent issue of ASTM Standard D-3212 with gaskets conforming to the most recent issue of ASTM Standard F-477.

C. SEWER PIPE AND FITTINGS, PVC, 3 inches AND SMALLER

1. Unless otherwise called for on the Drawings, sewer pipe and fittings shall be Type PSM Polyvinyl Chloride Schedule 80 with Solvent Welded DWV fittings., meeting requirements of the most recent ASTM D 1785.

D. SEWER PIPE AND FITTINGS, HDPE Pipe

1. Polyethylene Plastic Pipe shall be High Density Polyethylene Pipe (HDPE) and meet applicable requirements of ASTM F14.
2. HDPE pipe and fittings will be used in accordance with the material specifications. All pipe installed by pipe bursting will be joined by butt fusion, or electro fusion.
3. HDPE pipe will be produced from resins meeting the requirements of ASTM D1248, designation PE 3408, ASTM D3350 cell classification PE345444C, and will meet the requirements of AWWA C901 and C906. HDPE pipe will meet the minimum stability requirements of ASTM D3350. Pipe will be legibly marked at intervals of no more than five feet with the manufacturers name, trademark, pipe size, HDPE cell classification, appropriate legend such as SDR 19 or SDR 17, ASTM D 3035, AWWA C901 or C906, date of manufacture and point of origin.
4. Pipe color shall be solid black unless otherwise specified in these contract documents.
5. Dimension Ratios: The minimum wall thickness of HDPE pipe shall meet the following:

Minimum DR

DR 19 or DR 17

E. SEWER PIPE, CAST IRON

1. Where called for on the Drawings, sewer pipe shall be hubless cast iron soil pipe meeting the requirements of the most recent issue of ASTM Standard A-888.

2. Pipe sections shall be joined using heavy duty shielded couplings conforming to the most recent issue of ASTM Standard C-1540.

F. FLEXIBLE COUPLING, SEWER PIPE

1. For joining plain end pipe shall be Calder, or equivalent.

G. SEWER MANHOLE

1. Sewer manhole shall conform with the applicable detail presented on the Drawings or to the referenced Standard Plan or Detail.
2. All joints between wall sections and between grade rings shall be sealed.
3. Full circumference waterstop shall be cast-in-place on pipe penetration at midpoint of wall.
4. Manway shaft shall be centered above upstream pipe inlet.
5. Channel through base shall slope (drop) across structure as called for on Drawings and 0.10 foot minimum.
6. Solid cover shall be lettered: "SEWER" and frame and cover shall be galvanized.
7. Flexible pipe joints shall be installed at junction between connecting pipes and stubs from manhole as shown on the Drawing detail.

H. SEWER CLEANOUT

1. Shall conform to the Detail Drawings.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Schedule gravity pipeline construction ahead of other underground conduit construction.
- B. Before beginning work, determine or verify the location and flowline elevation of all existing water and sewer structures and pipes to be joined by new construction; see Paragraph 3.02 hereof.
- C. Before beginning work, determine or verify the location and depth of all existing structures, pipes, or conduits which cross or otherwise may conflict with new construction; see Paragraph 3.02 hereof.
- D. Before beginning work, verify that excavation will not take place below a line projected downward at a 2 horizontal to 1 vertical slope from a point 9 inches above the bottom of existing or proposed building foundations adjacent to the work; if proposed trench / foundation geometry is determined to be contrary to this requirement, request direction from Architect before proceeding with the work.

- E. Employ a Licensed Surveyor to provide line and grade control stakes for construction of gravity pipelines, to survey locations of existing facilities to be joined by or which may interfere with new construction, and to provide confirmation during construction that facilities are at required line and grade.

3.2 EXPLORATORY INVESTIGATION, EXCAVATION AND SURVEYING

A. INVESTIGATING, LOCATING AND MARKING FACILITIES

- 1. Before beginning trenching or other excavation, investigate and determine the locations of all existing utilities that are included in the work area, or which may be affected by the work, and mark these locations at the site with paint or flags. Utilities shall mean water, sewer, storm drain, gas, electrical power, and data and voice communication piping or conduits and wiring and appurtenances.

B. EXPOSING BURIED FACILITIES

- 1. For existing buried piping, conduits, and structures to be joined by proposed construction, or which may cross or otherwise interfere with proposed construction, excavate to expose and survey said facilities for determining or confirming exact location, configuration, size, material and use. Exercise care to avoid damage to facilities which are to remain in service. Notify Owner's Representative of any unexpected or changed conditions at least five working days in advance of ordering materials or scheduling work.

C. SURVEYING EXPOSED FACILITIES

- 1. Pursuant to Paragraph 3.02-B hereof, employ a Licensed Land Surveyor to determine horizontal and vertical locations of existing buried piping, conduits and structures to be joined by new construction or which cross or may otherwise interfere with proposed construction and provide this information to Engineer for review. Allow at least five working days for review. More time may be required depending on completeness of information provided and on extent of conflicts, if any.

3.3 MAINTAINING SERVICE / NOTIFICATION

- A. Do not interrupt water, sewer and utility service to buildings to remain in use during the hours of 8:00 a.m. to 5:00 p.m, Monday through Friday. If such interruption cannot be avoided, it shall be coordinated with and approved by District Maintenance / Operations staff at least seven days in advance. Timing and duration of service interruption must also be approved in advance by School Administration so as not to adversely impact school and extra curricular activities.
- B. Maintain continuous sanitary flow of sewage at all times. Provide, install, and maintain temporary pumps and piping as necessary.

3.4 ABANDONING CONDUITS IN PLACE

- A. Seal all openings into piping and other conduits to be abandoned in place with either a factory cap or plug manufactured specifically for the type of pipe or conduit being abandoned or by filling the opening to three feet beyond the end with concrete.

3.5 EXCAVATION EXAMINATION

- A. Verify that excavation dimensions and elevations are as indicated on the Drawings, including due allowance for required thickness of bedding material, and that the excavation is ready to receive structure or pipeline work.
- B. Verify that excavation finish subgrade condition has been reviewed and approved by the Owner's Geotechnical Engineer.

3.6 EXCAVATION PREPARATION

- A. Hand trim excavations if required for conformance with dimensions and elevations indicated on the Drawings. Remove excess material.

3.7 PIPE INSTALLATION

- A. Install and join pipe and fittings to lines and grades indicated on the Drawings in accordance with manufacturer's instructions and with applicable requirements of referenced Standards, Specifications and Details. Hand shape bedding materials as required to accommodate and to provide uniform support for pipe barrel and bell and for pipe fittings.
 - 1. Before placing pipe zone backfill for gravity pipelines, have Licensed Surveyor confirm that line and grade of pipe and fittings conform with Drawing requirements.
 - 2. While completing trench backfill for PVC pipelines, provide a continuous length of detectable warning tape marked "SEWER" at the centerline of the trench and 12 inches below finish grade in unpaved areas or at subgrade (bottom of base course) in paved areas.

3.8 FIELD QUALITY CONTROL

- A. Request inspection by Owner's Representative after installation and assembly of, but before covering, piped utilities; for fire protection waterline, also request inspection by Fire Department representative.
 - 1. Request inspection of sewer manhole base including piping connections, sewer main/lateral wye fittings, and sewer lateral flexible couplings.
 - 2. Request inspection of waterline valve/fitting assemblies, thrust block excavation, and thrust block and anchor bar placement.
 - 3. Request inspection of any piping penetration of walls and/or footings.

3.9 PIPELINE LEAKAGE TESTING

- A. Perform leakage testing of new sewer main and lateral piping in accordance with Section 306-1.4 of SSPWC using Water Exfiltration Test.

3.10 SAFETY

- A. Be solely responsible for vehicular and pedestrian traffic control and safety and furnish, install, and maintain such fencing, signs, lights, trench plates, barricades, and/or other protection as is necessary for said control and safety.
- B. Provide, furnish, install, and maintain such sheeting, shoring, bracing, or other protection as is necessary to prevent failure of temporary excavations and embankments and to prevent damage to existing improvements, temporary improvements, and partially completed portions of the work. Be solely responsible for the sufficiency of such supports or other protection.

3.11 PAVED SURFACE RESTORATION

A. NEW PAVEMENT

- 1. If trench surfacing is to be included with new pavement or reconstructed pavement, construct pavement structural section in accordance with the Drawings and Specifications.

B. PATCHED PAVEMENT

If trench surfacing is to be a patch within an existing paved surface to remain, construct as follows:

- 1. Construct final sawcut lines 1-foot minimum beyond limits of trench and beyond any areas damaged by construction; final sawcut lines are in addition to those made for initial trench operations.
- 2. Construct pavement structural section (thickness of aggregate base and surfacing) to match existing except where trench backfill is slurry cement which shall be carried to the bottom of asphalt pavement or concrete surfacing.
- 3. Unless waived by Architect, construct sealcoat over the full width of asphalt pavement surfacing along the full length of the trench.
- 4. Replace pavement markings and delineation in kind.

Section continues on next page

3.12 SUBMITTAL REQUIREMENTS AND SCHEDULE

Include this form with submittals of this Specification Section, unless a substitute product is being proposed, in which case refer to Division 1, "Substitutions" section, for substitution requests.

Contractor's [Contractor is to acknowledge with initials each submittal included]

Initials: _____

_____ Letter of explanation attached for each submittal not included.

_____ All submitted products are as specified.

SUBMITTAL SCHEDULE

- _____ 1. Manufacturer's product data and recommended installation procedures for water and sewer pipe, fittings, adapters, couplings, joints restraint devices, polyethylene encasement.
- _____ 2. Manufacturer's product data for waterworks valves, fire hydrants, backflow prevention devices.
- _____ 3. Manufacturer's product data for precast concrete vault and manhole sections.
- _____ 4. Manufacturer's product data for frames and covers for sewer cleanouts and manholes and for water valve boxes.
- _____ 5. Concrete mix design for each class of concrete required.

SECTION 331000 - WATER DISTRIBUTION PIPING AND EQUIPMENT**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Provide materials, equipment and transportation and perform labor as required to:
 - 1. Make exploratory investigations, excavations and surveys as necessary to ascertain locations and physical characteristics of existing buried pipelines, conduits and structures within work area prior to ordering materials or scheduling work and
 - 2. Construct potable water mainline improvements between designated points of connection with existing facilities and to designated points of connection with piping stubbed from building or
 - 3. Repair or relocate existing buried site utilities encountered during construction of other site improvements.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 312000: Site Grading
- B. Section 312300: Trenching and Backfilling
- C. Section 312500: Construction Storm Water Pollution Prevention

1.04 STANDARD SPECIFICATIONS

- A. Construction materials and methods shall be in accordance with the *Standard Specifications for Public Works Construction*, 2021 edition (SSPWC), published by Building News, Inc., except as modified or otherwise specified herein (hereinafter the Standard Specifications).
- B. In case of conflict between the Standard Specifications and the project specifications, the project specifications shall govern.

1.05 REFERENCE SPECIFICATIONS / REFERENCE DETAILS

- A. Materials shall conform to the applicable requirements of *American Society for Testing and Materials (ASTM) Standards*, *American Water Works Association (AWWA) Standards* and *American National Standards Institute (ANSI) Standards*, latest editions.
- B. Polyvinyl chloride (PVC) pipe construction shall be in accordance with the *Handbook of PVC Pipe*, latest edition, published by the Uni-Bell Plastic Pipe Association.
- C. Vitrified clay pipe (VCP) pipeline construction shall be in accordance with the *Clay Pipe Engineering Manual*, latest edition, published by the National Clay Pipe Institute.
- D. Ductile Iron Pipe (D.I.P.) pipeline construction shall be in accordance with the *Handbook of Ductile Iron Pipe*, latest edition, published by the Ductile Iron pipe Research Association.
- E. Where called for on the Drawings or in these Specifications, construction materials and methods shall be in accordance with the *County Public Works Department (Transportation Division) Standard Details*, September 2011 update, which include by reference the current versions of *Standard Specifications* and *Standard Plans* of the *California Department of Transportation (Caltrans)*.
- F. Where called for on the Drawings or in these Specifications, construction materials and methods shall be in conformance with the *Golden State Water Company's Requirements and Standard Drawings*.
- G. In case of conflict between the Standard Specifications and Reference Specifications, the Reference Specifications shall govern.
- H. In case of conflict between Reference Specifications and the Project Specifications, the more stringent provision shall govern, as determined by the Owner's Representative and the Engineer.

1.06 REGULATORY REQUIREMENTS

- A. Construction shall comply with the *California Code of Regulations, Title 24, Part 2 (the California Building Code)*, most recent effective edition.

1.07 SUBMITTALS

- A. Provide submittals according to the Conditions of the Contract and Division 1 "Submittal Procedures" section.
- B. Refer to "Submittal Requirements and Schedule" at the end of this Section.

1.08 RECORD DOCUMENTS

- A. Comply with requirements of Division 1, "Project Record Documents" section, and the following:
 - 1. Accurately record results of exploratory investigations regarding locations and characteristics of existing buried pipelines and conduits.
 - 2. Accurately record locations of constructed pipelines, fittings, valves, connections and appurtenant structures, including depth below finish grade to waterlines and invert elevations of sewer.
 - 3. Accurately record changes from construction identified on Drawings and Specifications, including unexpected physical conditions and unmarked or inaccurately marked existing utilities.

PART 2 - MATERIALS

2.01 ON-SITE POTABLE WATER, 4" THROUGH 10" SIZE

- A. WATERLINE PIPE, POLYVINYL CHLORIDE (PVC)
 - 1. Polyvinyl Chloride (PVC) pipe shall be Pressure Class 305, DR-14, cast iron pipe size, with integrally molded bell and spigot for gasketed joint assembly, meeting requirements of the most recent issue of ASTM Specification D-2241 and AWWA Standard C-900.
 - 2. Tracer wire for attachment to PVC waterline pursuant to Paragraph 3.08 herein, shall be minimum 12-gauge insulated soft copper.
- B. WATERLINE PIPE, DUCTILE IRON
 - 1. Ductile iron pipe (DIP) with push-on or mechanical joint ends shall be Pressure Class 350, conforming to the most recent issue of AWWA Standard C-151.
 - 2. Ductile iron pipe with flanged ends shall be Class 53, conforming to the most recent issue of AWWA Standards C-151 and C-115.
 - 3. Ductile iron pipe shall be lined with cement mortar sealed with a bituminous coating in accordance with the most recent issue of AWWA Standard C-104. The exterior surface of all ductile iron pipe to be buried shall be coated with a 1-mil thick bituminous coating in accordance with ANSI Standard A21.6. Lining and coating application shall be at the place of manufacture.
 - 4. Polyethylene film for encasing buried ductile iron pipe and ductile or cast iron fittings during installation pursuant to Paragraph 3.13 herein shall conform with the

most recent issue of AWWA Standard C-105 and shall have a minimum nominal thickness of 0.008 inches (8 mil).

5. Material for double-coating buried bolting systems after tightening but before encasing with polyethylene shall be NO-OX-ID or A-Special or equivalent.

C. WATERLINE PIPE FITTINGS, DUCTILE IRON

1. Fittings for PVC and ductile iron waterline shall be cast or ductile iron conforming to the most recent issue of AWWA Standards C-110 or C-153.
 - a. Fitting ends for buried installation shall be push-on or mechanical joint, except for connections to valves and other fittings which shall be flanged. Bolts and gaskets for use with mechanical joints shall conform with the most recent issue of AWWA Standard C-111.
 - b. Fitting ends for above-ground installation shall be flanged. Bolts and gaskets for use with flanged joints shall conform with AWWA Standard C-110.
2. Fittings shall be lined with cement mortar sealed with a bituminous coating in accordance with the most recent issue of AWWA Standard C-104. The exterior surface of all fittings to be buried shall be coated with a 1-mil thick bituminous coating in accordance with the most recent issue of ANSI Standard A21.6. Lining and coating shall be at the place of manufacture.
3. Polyethylene film for encasing buried ductile or cast iron fittings during installation pursuant to Paragraph 3.13 herein shall conform with the most recent issue of AWWA Standard C-105 and shall have a minimum nominal thickness of 0.008 inches (8 mil).
4. Material for double-coating buried bolting systems after tightening but before encasing with polyethylene shall be NO-OX-1D or A-Special or equivalent.

D. MECHANICAL JOINT RESTRAINT, DUCTILE IRON PIPE FITTINGS

1. Where called for on the Drawings, mechanical joint restraint for ductile iron pipe and fittings shall be incorporated into the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Gland shall be ductile iron with dimensions such that it can be used with the standard mechanical joint bell and tee-head bolts. Twist-off nuts shall be used to ensure proper actuating of the restraining devices.

2. The joint restraint device shall be listed by Underwriters Laboratories, Inc., and be Factory Mutual approved.
3. The mechanical joint restraint device shall have a working pressure of at least 350 psi with minimum safety factor of 2:1 and shall be Series 1100 MEGALUG (for D.I.P.) or Series 2000 MEGALUG (for C-900 PVC pipe), manufactured by EBAA Iron, Inc., or equivalent.

E. FLANGED BY MECHANICAL JOINT ADAPTERS, WATERLINE

1. Flanged by mechanical joint adapters shall be cast or ductile iron fitting conforming to Paragraph 2.01-C herein.

F. ADAPTERS AND COUPLINGS, WATERLINE

1. Flanged coupling adapters, flexible couplings and transition couplings shall be as manufactured for the specific application by ROMAC Industries, Inc. or by Smith-Blair, Inc.
2. Adapters and couplings shall be lined with factory-applied thermo setting epoxy resin, 12 mils minimum dry film thickness, in accordance with the most recent issue of AWWA Standard C-550.
3. Adapters and couplings subject to burial shall be coated and encased in accordance with Paragraph 3.13 herein.

G. GATE VALVES, BURIED WATERLINE

1. Valves shall be iron-bodied, resilient-seated, bronze-mounted, non-rising stem type gate valves conforming to the most recent issue of AWWA Standard C-509, with double O-ring stem seal. Valves shall OPEN LEFT. Valve ends shall be flanged or mechanical type as required for the type of pipe or fitting to be joined. Valve and operator shall be suitable for buried service and shall have a 2-inch square AWWA operating nut.
2. An operator shaft extension to 12 inches below finish grade shall be provided when cover over the valve operator nut exceeds 48 inches.
3. Valves shall be lined with 12-mils minimum thickness fusion-bonded epoxy in accordance with the most recent issue of AWWA Standard C-550. The exterior surface of valve bodies and operator housings and extensions to be buried shall be coated with two coats of asphalt varnish conforming to the most recent issue of AWWA Standard C-500. Lining and coating application shall be at the place of manufacture.

4. Buried valves shall be encased during installation with polyethylene in accordance with the most recent issue of AWWA Standard C-105. Polyethylene film shall have a nominal thickness of 0.008 inches (8 mil).

2.02 ON-SITE POTABLE WATER, 3" AND SMALLER

A. WATERLINE PIPE, POLYVINYL CHLORIDE (PVC)

1. Pipe shall be Schedule 80 PVC conforming to ASTM D-1785.
2. Fittings shall be Schedule 80 PVC (Schedule 120 when called for on Drawings) conforming to ASTM D-2467.
 - a. Use PVC male thread fitting at connection to copper tubing.
3. Joints shall be solvent weld conforming to ASTM D-2855 using solvent cement conforming to ATM D-2564.
4. Pipe wall and solvent cement container shall bear the National Sanitation Foundation seal for potable water pipe.

B. WATERLINE PIPE, 3" AND SMALLER, COPPER

1. Pipe shall be seamless copper water tube conforming to ASTM B-88, Type "K" for below ground and for partially above / partially below ground.
2. Fittings shall be cast bronze conforming to ANSI B 16.18 or wrought copper and bronze conforming to ANSI B 16.22.
3. Joints shall be threaded or soldered, as called for on the Drawings.
4. Solder metal shall be lead free, silver bearing (Bridget or equivalent).

C. WATER SHUTOFF VALVES, BURIED

1. The following are District Standards, no substitutions are allowed:
 - a. Ball Valves, 2 ½" and 3": Nibco T-580.
 - b. Ball Valves, less than 2 ½": Nibco S-585 Full Port.
 - c. Gate Valve, 3": Nibco Gate Valve O.S. & Y. Coated Ductile Iron.

D. COUPLINGS, PLAIN END PIPE

1. For copper piping, 3" and smaller: Nibco #733 Union.

2. For PVC piping, 4" through 8": Dresser Style 38, Smith-Blair Style 411, Romac Style 400.

E. VALVE BOX, BURIED WATERLINE

1. Shall be adjustable cast iron Park-Sons Buffalo type supplied with frame and cast iron cover marked "WATER." Frame and cover shall be galvanized.

F. YARD BOX, BURIED WATERLINE

1. Concrete box supplied with traffic weight galvanized cast iron frame and cover (Brooks or equivalent).
2. Size to meet field conditions after assembly of valves and fittings; valve operator shall not be more than 12 inches below top of cover.

2.03 CONCRETE FOR WATERLINE THRUST BLOCKS

1. Concrete for thrust and anchor blocks shall conform with the *California Code of Regulations, Title 24, Part 2, Chapter 19, Concrete*.
2. Concrete shall conform with Section 321313 Site Concrete hereof.

2.04 STEEL ANCHOR BARS FOR WATERLINE THRUST BLOCKS

1. Bars for anchoring valves and fittings to concrete thrust/anchor blocks shall be No. 4 deformed billet-steel for concrete reinforcement conforming to the most recent issue of ASTM Standard A-615, Grade 60, coated with purple fusion-bonded epoxy conforming to ASTM Standard A-934.
2. Bars exposed to soil shall be double-coated with NO-OX-ID or A-Special or equivalent.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Schedule gravity pipeline construction ahead of other underground conduit construction.
- B. Before beginning work, determine or verify the location and flowline elevation of all existing water and sewer structures and pipes to be joined by new construction; see Paragraph 3.02 hereof.
- C. Before beginning work, determine or verify the location and depth of all existing structures, pipes, or conduits which cross or otherwise may conflict with new construction; see Paragraph 3.02 hereof.

- D. Before beginning work, verify that excavation will not take place below a line projected downward at a 2 horizontal to 1 vertical slope from a point 9" above the bottom of existing or proposed building foundations adjacent to the work; if proposed trench / foundation geometry is determined to be contrary to this requirement, request direction from Architect before proceeding with the work.
- E. Employ a Licensed Surveyor to provide line and grade control stakes for construction of gravity pipelines, to survey locations of existing facilities to be joined by or which may interfere with new construction, and to provide confirmation during construction that facilities are at required line and grade.

3.02 EXPLORATORY INVESTIGATION, EXCAVATION AND SURVEYING

A. INVESTIGATING, LOCATING AND MARKING FACILITIES

- 1. Before beginning trenching or other excavation, investigate and determine the locations of all existing utilities that are included in the work area, or which may be affected by the work, and mark these locations at the site with paint or flags. Utilities shall mean water, sewer, storm drain, gas, electrical power, and data and voice communication piping or conduits and wiring and appurtenances.

B. EXPOSING BURIED FACILITIES

- 1. For existing buried piping, conduits, and structures to be joined by proposed construction, or which may cross or otherwise interfere with proposed construction, excavate to expose and survey said facilities for determining or confirming exact location, configuration, size, material and use. Exercise care to avoid damage to facilities which are to remain in service. Notify Owner's Representative of any unexpected or changed conditions at least five working days in advance of ordering materials or scheduling work.

C. SURVEYING EXPOSED FACILITIES

- 1. Pursuant to Paragraph 3.02-B hereof, employ a Licensed Land Surveyor to determine horizontal and vertical locations of existing buried piping, conduits and structures to be joined by new construction or which cross or may otherwise interfere with proposed construction and provide this information to Engineer for review. Allow at least five working days for review. More time may be required depending on completeness of information provided and on extent of conflicts, if any.

3.03 MAINTAINING SERVICE / NOTIFICATION

- A. Do not interrupt water, sewer and utility service to buildings to remain in use during the hours of 8:00 a.m. to 5:00 p.m, Monday through Friday. If such interruption cannot be avoided, it shall be coordinated with and approved by District Maintenance / Operations

staff at least seven days in advance. Timing and duration of service interruption must also be approved in advance by School Administration so as not to adversely impact school and extra curricular activities.

- B. Do not shut-down water mains supplying fire hydrants or fire sprinklers without advance notification to Fire Department of time and duration of shutdown, in addition to coordination and approvals required per Paragraph A above.
- C. Maintain continuous sanitary flow of sewage at all times. Provide, install, and maintain temporary pumps and piping as necessary.

3.04 CONSTRUCTING / ABANDONING CONNECTIONS TO WATERMAIN TO REMAIN IN SERVICE

- A. Schedule and prepare for work requiring shut-down of watermain such that all work is completed during one shutdown.
- B. Make excavations at each proposed location in order to confirm the exact location, character and configuration of work and to ensure that required materials are on-site prior to shutdown.
- C. Disinfect the interior and exterior of all pipes and fittings to be connected to the watermain in advance of installation by swabbing or spraying with a one per cent hypochlorite solution.

3.05 ABANDONING CONDUITS IN PLACE

- A. Seal all openings into piping and other conduits to be abandoned in place with either a factory cap or plug manufactured specifically for the type of pipe or conduit being abandoned or by filling the opening to three feet beyond the end with concrete.

3.06 EXCAVATION EXAMINATION

- A. Verify that excavation dimensions and elevations are as indicated on the Drawings, including due allowance for required thickness of bedding material, and that the excavation is ready to receive structure or pipeline work.
- B. Verify that excavation finish subgrade condition has been reviewed and approved by the Owner's Geotechnical Engineer.

3.07 EXCAVATION PREPARATION

- A. Hand trim excavations if required for conformance with dimensions and elevations indicated on the Drawings. Remove excess material.

3.08 PIPE INSTALLATION

- A. Install and join pipe and fittings to lines and grades indicated on the Drawings in accordance with manufacturer's instructions and with applicable requirements of referenced Standards, Specifications and Details. Hand shape bedding materials as required to accommodate and to provide uniform support for pipe barrel and bell and for pipe fittings.
 - 1. Before placing pipe zone backfill for gravity pipelines, have Licensed Surveyor confirm that line and grade of pipe and fittings conform with Drawing requirements.
 - 2. While completing trench backfill for PVC pipelines, provide a continuous length of detectable warning tape marked "WATER" at the centerline of the trench and 12" below finish grade in unpaved areas or at subgrade (bottom of base course) in paved areas.

3.09 THRUST BLOCKS, WATERLINE

- A. Provide thrust blocks at dead ends, tees, unbalanced crosses, bends equal to or greater than 11 degrees and other locations indicated on the Drawings or specified herein.
- B. Configure thrust blocks for the type of fitting and angle of flow diversion indicated on the Drawing Plans in accordance with the referenced Detail Drawing.
- C. Construct thrust blocks monolithically. Pour concrete firmly against undisturbed soil and do not allow concrete to set in contact with pipe surfaces or to enter or set in contact with any joint.

3.10 VALVE BOX

- A. Construct Valve Box assembly in accordance with the referenced Detail Drawing.

3.11 POLYETHYLENE ENCASEMENT, BURIED IRON WATERLINE

- A. Encase buried iron pipe, valves and fittings during installation with polyethylene in accordance with the most recent issue of AWWA Standard C-105. Polyethylene film shall have minimum nominal thickness of 0.008 inches (8 mil).
- B. Prior to encasement, double-coat all bolts and metal surfaces not already coated with NO-OX-ID or A-Special or equivalent.

3.12 FIELD QUALITY CONTROL

- A. Request inspection by Owner's Representative after installation and assembly of, but before covering, piped utilities; for fire protection waterline, also request inspection by Fire Department representative.

1. Request inspection of sewer manhole base including piping connections, sewer main/lateral wye fittings, sewer lateral flexible couplings.
2. Request inspection of waterline valve/fitting assemblies, thrust block excavation, and thrust block and anchor bar placement.
3. Request inspection of any piping penetration of walls and/or footings.

3.13 PIPELINE LEAKAGE TESTING

- A. Perform leakage testing of new waterline piping in accordance with Section 306-1.4 of SSPWC using Water Pressure Test of 200 PSI.

3.14 WATERLINE DISINFECTION

- A. Disinfect and bacteriologically test potable water piping and appurtenances prior to placing into service or joining with the existing distribution system.
- B. Furnish and install necessary end caps, thrust blocks, pipe, pumps, hose, fittings, and valves required to inject water into and discharge water from the extremities of the test section. Be responsible for safe disposal of super-chlorinated water.
- C. Conduct disinfection procedures in accordance with the most recent issue of AWWA Standard C-651, using the continuous feed method for chlorination of waterline sections which can be isolated and "...Procedures when Cutting into or Repairing Existing Mains" for chlorination of piping and appurtenances used to join existing facilities. When stopping flow of water into new waterline section, tightly close valve at connection to existing facilities BEFORE closing outlet valves on new waterline section.

3.15 BACTERIOLOGICAL TESTING

- A. After disinfection and residual flushing, the water within the piping shall be tested and determined acceptable for domestic consumption by a testing laboratory approved by the public health authority having jurisdiction and by the Owner and Architect before connection is made to the existing mains(s).
- B. Should the test results prove unacceptable, the disinfection procedure shall be repeated as necessary at Contractor's expense.

3.16 SAFETY

- A. Be solely responsible for vehicular and pedestrian traffic control and safety and furnish, install, and maintain such fencing, signs, lights, trench plates, barricades, and/or other protection as is necessary for said control and safety.

- B. Provide, furnish, install, and maintain such sheeting, shoring, bracing, or other protection as is necessary to prevent failure of temporary excavations and embankments and to prevent damage to existing improvements, temporary improvements, and partially completed portions of the work. Be solely responsible for the sufficiency of such supports or other protection.

3.17 PAVED SURFACE RESTORATION

A. NEW PAVEMENT

- 1. If trench surfacing is to be included with new pavement or reconstructed pavement, construct pavement structural section in accordance with the Drawings and Specifications.

B. PATCHED PAVEMENT

If trench surfacing is to be a patch within an existing paved surface to remain, construct as follows:

- 1. Construct final sawcut lines 1-foot minimum beyond limits of trench and beyond any areas damaged by construction; final sawcut lines are in addition to those made for initial trench operations.
- 2. Construct pavement structural section (thickness of aggregate base and surfacing) to match existing except where trench backfill is slurry cement which shall be carried to the bottom of asphalt pavement or concrete surfacing.
- 3. Unless waived by Architect, construct sealcoat over the full width of asphalt pavement surfacing along the full length of the trench.
- 4. Replace pavement markings and delineation in kind.

Section continues on next page

3.18 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of this Specification Section, unless a substitute product is being proposed, in which case refer to Division 1, "Substitutions" section, for substitution requests.

Contractor's [Contractor is to acknowledge with initials each submittal included]
Initials:_____

_____ Letter of explanation attached for each submittal not included.

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE

- _____ 1. Manufacturer's product data and recommended installation procedures for water and sewer pipe, fittings, adapters, couplings, joints restraint devices, polyethylene encasement.
- _____ 2. Manufacturer's product data for waterworks valves, fire hydrants, backflow prevention devices.
- _____ 3. Manufacturer's product data for precast concrete vault and manhole sections.
- _____ 4. Manufacturer's product data for frames and covers for sewer cleanouts and manholes and for water valve boxes.
- _____ 5. Concrete mix design for each class of concrete required.

END OF SECTION

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SECTION 334100 - STORM DRAINAGE PIPING**PART 1 - GENERAL****1.01 SUMMARY**

- A. Includes materials, equipment, transportation and labor as required to:
 - 1. Make exploratory investigations, excavations and surveys as necessary to ascertain locations and physical characteristics of existing buried pipelines and conduits within work area and
 - 2. Construct storm drainage piping and fittings.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 312300: Trenching and Backfilling
- B. Section 312500: Construction Storm Water Pollution Prevention
- C. Section 334900: Storm Drainage Structures

1.04 STANDARD SPECIFICATIONS

- A. Construction materials and methods shall be in accordance with the *Standard Specifications for Public Works Construction*, 2021 edition (SSPWC), published by Building News, Inc., except as modified or otherwise specified herein (hereinafter the Standard Specifications).
- B. In case of conflict between the Standard Specifications and the project specifications, the project specifications shall govern.

1.05 REFERENCE SPECIFICATIONS / REFERENCE DETAILS

- A. Materials shall conform to the applicable requirements of *American Society for Testing and Materials (ASTM) Standards*, *American Water Works Association (AWWA) Standards* and *American National Standards Institute (ANSI) Standards*, latest editions.
- B. Polyvinyl chloride (PVC) storm drain construction shall be in accordance with the *Handbook of PVC Pipe*, latest edition, published by the Uni-Bell Plastic Pipe Association.

- C. Where called for on the Drawings or in these Specifications, construction materials and methods shall be in accordance with *City of San Luis Obispo Public Works Department Construction Standard Details*.
- D. Where called for on the Drawings or in these Specifications, construction materials and methods shall be in accordance with the *Standard Specifications and Standard Plans of the State of California Department of Transportation*, most recent effective editions (CalTrans Standards). Where Metric Units of measure are used in the referenced CalTrans Standards, the equivalent English Units shall be used.
- E. In case of conflict between the Standard Specifications and Reference Specifications, the Reference Specifications shall govern.
- F. In case of conflict between Reference Specifications / Details and the project specifications / details, the more stringent provision shall govern, as determined by the Architect and the Engineer.

1.06 REGULATORY REQUIREMENTS

- A. Construction shall comply with the *California Code of Regulations, Title 24, Part 2 (the California Building Code)*, most recent effective edition.

1.07 SUBMITTALS

- A. Provide submittals according to the Conditions of the Contract and Division 1 "Submittal Procedures" section.
- B. Refer to "Submittal Requirements and Schedule" at the end of this Section.

1.08 RECORD DOCUMENTS

- A. Comply with requirements of Division 1, "Project Record Documents" section, and following:
 - 1. Accurately record location of catch basins, junction structures, piping, bends, connections, and appurtenant structures, including top-of-grate and pipe/structure invert elevations, for Record Documents.
 - 2. Accurately record changes in construction from that called for on the Drawings and Specifications, including unexpected physical conditions and unmarked or inaccurately marked existing utilities, for Record Documents.

PART 2 - MATERIALS

2.01 STORM DRAIN PIPE AND FITTINGS

- A. POLYVINYL CHLORIDE (PVC), ASTM D 3034

1. Pipe and fittings shall be Type PSM Poly-vinyl Chloride (PVC) with integrally molded bell and spigot for gasketed joint assembly, conforming to the most recent issue of ASTM Standard D-3034 (SDR 35) for 4" through 15" size and ASTM F-679 (Wall Thickness T-1) for 18" through 27" size, unless otherwise called for on the Drawings.
2. Joints shall comply with the most recent issue of ASTM Standard D-3212 with gaskets conforming to the most recent issue of ASTM Standard F-477.

B. POLYVINYL CHLORIDE (PVC), AWWA A C-900

1. Pipe and fittings for 4" through 12" size shall be Polyvinyl Chloride (PVC) Class 200, DR-14, cast iron pipe size, with integrally molded bell and spigot for gasketed joint assembly, meeting requirements of the most recent issue of ASTM Specification D-2241 and AWWA Standard C-900.

C. DUCTILE IRON

1. Ductile iron pipe (D.I.P.) shall be Pressure Class 350, with push-on joint ends, conforming to the most recent issue of AWWA Standard C-151.

Fittings shall be cast or ductile iron conforming to the most recent issue of AWWA Standards C-110 or C-153.

2. Ductile iron pipe and fittings shall be lined with cement mortar sealed with a bituminous coating in accordance with the most recent issue of AWWA Standard C-104. The exterior surface of all fittings to be buried shall be coated with a 1-mil thick bituminous coating in accordance with the most recent issue of ANSI Standard A21.6. Lining and coating shall be at the place of manufacture.
3. Buried ductile iron pipe shall be encased during installation with polyethylene in accordance with the most recent issue of AWWA Standard C-105. Polyethylene film shall have a nominal thickness of 0.998 inches (8 mil).

D. RECTANGULAR CAST IRON PIPE

1. Rectangular cast iron pipe (C.I.P.) shall be No. A-470 as manufactured by Alhambra Foundry Company, Ltd., or equivalent, with bell and spigot ends and 5'-0" laying length.
2. Cast iron adapters for transition from round to rectangular pipe shall be Alhambra Foundry No. A-480, or equivalent.

E. REINFORCED CONCRETE PIPE

1. Reinforced concrete pipe (RCP) shall conform with the most recent issue of ASTM Standard C-76 for strength Class III (1350-D) minimum.

2. Joints shall be tongue and groove type to be fully mortared, inside and out, during installation.

F. HIGH DENSITY POLYETHYLENE (HDPE) PIPE, GASKETED JOINTS

1. HDPE pipe and fittings for 4" through 48" size shall be N-12 Prolink WT (watertight) series as manufactured by Advanced Drainage Systems, Inc. (ADS).
2. Lateral connections to HDPE mainlines shall be made using manufacturer's Watertight Series 35 thermo-molded PVC reducing wye fittings.
3. Connections to concrete structures shall be made using manufacturer's Watertight Series thermo-molded PVC coupling cast into structure wall with waterstop at midpoint of wall.
4. Pipe and fitting shipping, handling and installation shall be in accordance with the manufacturer's recommended procedures.

2.02 SUBDRAIN PIPE AND FITTINGS

- A. Pipe and fittings 4" and 6" size shall be Poly-Vinyl Chloride (PVC) conforming to the most recent issue of ASTM D-1785 (SCH 40) assembled using solvent weld joints.
- B. Perforations shall be ½" diameter and shall be in two rows parallel with the pipe axis and 120° apart (60° above the pipe invert on each side).
- C. Solvent cement shall comply with ASTM D-2564.
- D. Perforated pipe shall be full encapsulated within a filter sock having an E.O.S. of 70 or less.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Schedule gravity pipeline construction ahead of other underground conduit construction.
- B. Before beginning work, determine or verify the location and flowline elevation of all existing drainage structures and pipes to be joined by new construction.
- C. Before beginning work, determine or verify the location and depth of all existing structures, pipes, or conduits which cross or otherwise may conflict with new construction.
- D. Before beginning work, verify that excavation will not take place below a line projected downward at a 2 horizontal to 1 vertical slope from a point 9 inches above the bottom of existing or proposed structure foundations adjacent to the work; if proposed trench /

foundation geometry is determined to be contrary to this requirement, request direction from Owner's Representative before proceeding with the work.

- E. Employ a Licensed Surveyor to provide line and grade control stakes for construction of storm drain facilities, to survey locations of existing facilities to be joined by or which may interfere with new construction, and to provide conformation during construction that facilities are at required line and grade.
- F. Begin gravity pipeline construction at the lowest point of discharge and proceed in the upgrade direction with the pipe bell end pointing upgrade.

3.02 EXPLORATORY INVESTIGATION, EXCAVATION AND SURVEYING

A. LOCATING AND MARKING FACILITIES

- 1. Before beginning trenching or other excavation, investigate and determine the locations of all existing utilities that are included in the work area, or which may be affected by the work, and mark these locations at the site with paint or flags. Utilities shall mean water, sewer, storm drain, gas, electrical power, and data and voice communication piping or conduits and wiring, and appurtenances.

B. EXPOSING BURIED FACILITIES

- 1. For existing buried piping, conduits, and structures to be joined by proposed construction, or which may cross or otherwise interfere with proposed construction, excavate to expose said facilities for purpose of determining exact location, configuration, type, and size. Exercise care to avoid damage to facilities which are to remain in service.

C. SURVEYING EXPOSED FACILITIES

- 1. Pursuant to Paragraph 3.02-B hereof, employ a Licensed Land Surveyor to determine horizontal and vertical locations of existing buried piping, conduits and structures to be joined by new construction or which cross or may otherwise interfere with proposed construction and provide this information to Engineer for review. Allow at least five working days for review. More time may be required depending on completeness of information provided and on extent of conflicts, if any.
- 2. Before beginning trenching for a proposed storm drain which will be constructed with less than 10-foot clear separation from an existing or proposed potable water mainline, determine by survey that the storm drain will have a clear separation of at least 4 feet horizontally from, and at least 1 foot vertically below, the water main.

3.03 EXCAVATION EXAMINATION

- A. Verify that excavation dimensions and elevations are as indicated on the Drawings, including due allowance for required thickness of bedding material, and that the excavation is ready to receive storm drainage structure and/or pipeline work.
- B. Verify that excavation finish subgrade condition has been reviewed and approved by the Construction-Phase Geotechnical Engineer.

3.04 EXCAVATION PREPARATION

- A. Hand trim excavations if required for conformance with dimensions and elevations indicated on the Drawings. Remove excess material.

3.05 PIPE INSTALLATION

- A. Unless otherwise called for on the Drawings, the minimum permissible slope of storm drain piping is one percent (1/8-inch per foot).
- B. Install and join pipe and fittings to lines and grades indicated on the Drawings in accordance with manufacturer's instructions and with applicable requirements of the Standard Specifications, Reference Specifications, and Reference Details. Hand shape bedding material as required to accommodate and to provide uniform support for pipe barrel and bell and for pipe fittings.
- C. If the design slope for storm drain piping is less than one percent (1/8-inch per foot), before placing pipe zone backfill have Licensed Surveyor confirm that line and grade of pipe and fittings conform with plan requirements by determining invert elevation of in-place piping opposite each grade stake.
- D. Construct PVC pipe bends using multiple 22 $\frac{1}{2}$ -degree fittings installed in series to achieve required deflection.
- E. Construct PVC pipe-to-pipe junctions using 45 degree straight or reducing wye fittings with branch laid at lateral pipe slope. Saddles are not permitted.
- F. Where cast or ductile iron pipe will remain in contact with soil after construction, encase the pipe in a polyethylene sheath, conforming to Paragraph 2.01-C.3 hereof, during installation.

3.06 FIELD QUALITY CONTROL

- A. Request inspection by Owner's Representative after installation and assembly of, but before covering, storm drainage piping.

- B. Before construction of pavement, walkways and other permanent surface improvements, provide a construction record drawing of the system prepared by a California Registered Land Surveyor to include top of grate or solid cover and inlet and outlet invert elevations of all storm drain structures, whether located in hard surfaced or in dirt / landscaped areas. Elevation measurements shall be accurate to 0.01 foot.
- C. Before construction of pavement, walkways and other permanent surface improvements, perform Water Exfiltration Test on storm drain piping and structures per SSPWC Section 306-1.4.2 except that "sewer" shall mean storm drain, "manhole" shall mean catch basin, water test level shall be 4 feet above catch basin invert or to top of frame level, whichever is less, and test period shall be 4 hours.
- D. Upon completion of construction of the storm drain system and with 48 hours notice to Owner's Representative, thoroughly clean and wash-down all inlets and storm drain piping. Immediately after cleaning, perform mandrel testing of PVC storm drains in accordance with Section 306-1.2.12 of the SSPWC.
- E. Within 48 hours of system cleaning and mandrel testing and prior to allowing any substance other than water into the storm drain system, supply water into the system for system review by the Owner's Representative.

If standing water is observed anywhere in system, third party video taping of the system shall then be scheduled by the Owner's Representative and performed at the Contractor's expense.

- F. Surveying, cleaning, mandrel testing and videotaping of the storm drain system shall be at Contractor's expense. Any deviation from the approved plans and design intent noted by the Owner's Representative during this process shall be corrected by Contractor at Contractor's expense and to the satisfaction of the Owner's Representative prior to acceptance of the system and final payment.
- G. ACCEPTABLE TOLERANCES:

- 1. Top-of-Grate: $\frac{1}{2}$ inch (0.04 foot) maximum deviation above or below design elevation in dirt surface.
 $\frac{1}{4}$ inch (0.02 foot) maximum deviation above or below design elevation in concrete or A.C. pavement surfacing.
- 2. Structure invert: $\frac{1}{2}$ inch (0.04 foot) deviation above or below design elevation and no standing water in structure or upstream pipe.
- 3. Pipe Invert: $\frac{1}{2}$ inch (0.04 foot) maximum deviation above or below design elevation at any location or 10

percent of design slope over any reach,
whichever is less, and no standing water.

4. In all such cases, deviations within the specified tolerances shall be compensating such that the average design slopes and elevations conform to those specified per plan.

Section continues on next page.

3.07 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of this Specification Section, unless a substitute product is being proposed, in which case refer to Division 1, "Substitutions" section, for substitution requests.

Contractor's [Contractor is to acknowledge with initials each submittal included]
Initials:_____

_____ Letter of explanation attached for each submittal not included.

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE

- _____ 1. Submit manufacturer's product data and recommended installation procedures for storm drain pipe and fittings.

END OF SECTION 334100

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SECTION 334900 - STORM DRAINAGE STRUCTURES**PART 1 – GENERAL****1.01 SUMMARY**

- A. Includes materials, equipment, transportation and labor as required for construction of cast-in-place catch basins and precast concrete manholes on storm drain piping systems.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 312300: Trenching and Backfilling
- B. Section 312500: Construction Storm Water Pollution Prevention
- C. Section 321313: Site Concrete
- D. Section 334100: Storm Drainage Piping

1.04 STANDARD SPECIFICATIONS

- A. Construction materials and methods shall be in accordance with the *Standard Specifications for Public Works Construction*, 2021 edition (SSPWC), published by Building News, Inc., except as modified or otherwise specified herein (hereinafter the Standard Specifications).
- B. In case of conflict between the Standard Specifications and the Project Specifications, the Project Specifications shall govern.

1.05 REFERENCE SPECIFICATIONS / REFERENCE DETAILS

- A. Materials shall conform to the applicable requirements of *American Society for Testing and Materials (ASTM) Standards*, *American Water Works Association (AWWA) Standards* and *American National Standards Institute (ANSI) Standards*, latest editions.
- B. Polyvinyl chloride (PVC) storm drain construction shall be in accordance with the *Handbook of PVC Pipe*, latest edition, published by the Uni-Bell Plastic Pipe Association.

- C. Where called for on the Drawings or in these Specifications, construction materials and methods shall be in accordance with *City of San Luis Obispo Public Works Department Construction Standard Details*.
- D. Where called for on the Drawings or in these Specifications, construction materials and methods shall be in accordance with the *Standard Specifications and Standard Plans of the State of California Department of Transportation*, most recent effective editions (CalTrans Standards). Where Metric Units of measure are used in the referenced CalTrans Standards, the equivalent English Units shall be used.
- E. In case of conflict between the Standard Specifications and Reference Specifications, the Reference Specifications shall govern.
- F. In case of conflict between Reference Specifications / Details and the Project Specifications / details, the more stringent provision shall govern, as determined by the Architect and the Engineer.

1.06 REGULATORY REQUIREMENTS

- A. Construction shall comply with the *California Code of Regulations, Title 24, Part 2 (the California Building Code)*, most recent effective edition.

1.07 SUBMITTALS

- A. Provide submittals according to the Conditions of the Contract and Division 1 "Submittal Procedures" section.
- B. Refer to "Submittal Requirements and Schedule" at the end of this Section.

1.08 RECORD DOCUMENTS

- A. Comply with requirements of Division 1, "Project Record Documents" section, and following:
 - 1. Accurately record location of catch basins, junction structures, piping, bends, connections, and appurtenant structures, including top-of-grate and pipe/structure invert elevations, for Record Documents.
 - 2. Accurately record changes in construction from that called for on the Drawings and Specifications, including unexpected physical conditions and unmarked or inaccurately marked existing utilities, for Record Documents.

PART 2 - MATERIALS

2.01 CONCRETE AND REINFORCING STEEL FOR DRAINAGE STRUCTURES

A. CONCRETE

1. Concrete shall conform with the *California Code of Regulations, Title 24, Part 2, Chapter 19*, concrete.
2. Concrete shall conform with Section 321313 hereof.

B. REINFORCING STEEL

1. Reinforcing steel shall be deformed billet-steel for concrete reinforcing conforming to the most recent issue of ASTM Standard A-615, Grade 60 for bar sizes No. 5 and larger, Grade 40 for bar sizes No. 3 and No. 4. Grade 60 acceptable for all sizes.

2.02 CATCH BASINS, CAST-IN-PLACE CONCRETE

A. DETAIL DRAWING

1. Where called for on the Drawings, catch basin shall be cast-in-place. Cast-in-place catch basin shall be formed inside and outside and shall conform to the applicable Detail presented on the Drawings or to the referenced Standard Plan or Detail.

B. CONSTRUCTION JOINTS

1. Drainage structure base and walls to a height equal to one nominal pipe diameter (12 inches minimum) above the outlet soffit (top of pipe) shall be poured monolithically. If judged necessary by contractor, one construction joint may be used between this height and the top of structure; surface of initial pour shall be roughened to provide 1/4" amplitude and shall be coated with epoxy prior to final pour.

C. WATERSTOP

1. Waterstop for pipe penetrations of catch basin walls shall be elastomeric PVC Concrete Manhole Adapter for 4" through 12" nominal diameter pipe and Large Diameter Waterstop for nominal pipe diameters greater than 12", as manufactured by FERNCO or approved equivalent.

2.03 MANHOLES

- A. Storm drain manhole shall conform with the applicable detail presented on the Drawings or to the referenced Standard Plan or Detail.

1. All joints between wall sections and between grade rings shall be sealed.
2. Full circumference waterstop shall be cast-in-place on pipe penetration at midpoint of wall.

3. Manway shaft shall be centered above upstream pipe inlet.
4. Channel through base shall slope (drop) across structure as called for on Drawings and 0.10 foot minimum.
5. Solid cover shall be lettered: "STORM DRAIN." Frame and cover shall be galvanized if located within concrete flatwork area.
6. Frame and cover shall conform with additional requirements of Paragraph 2.07 below.
7. When manhole is located within concrete flatwork area, frame for cover shall be cast directly in flatwork concrete.

2.04 GRATES / COVERS

- A. Unless otherwise called for on the Drawings or specified herein, catch basin grates shall be bicycle-proof (not ADA compliant) H-20 traffic-weight cast iron grate supplied with frame. Size shall be as manufactured for catch basin clear opening called for on the Drawings. Dimensions of bicycle-proof grate openings shall comply with CalTrans Standard Plan D77-B (nominally 1 ½" wide by 5" long).
- B. When catch basin is to be constructed in walkway or where otherwise called for on the Drawings, grate shall be ADA compliant non-traffic weight cast iron grate supplied with frame. ADA compliant grate shall have slotted openings, uniformly ½ inch in width, to be oriented perpendicular to the path of pedestrian travel.
- C. If required ADA compliant grate is in vehicle traffic area, H-20 traffic-weight welded steel grate with frame meeting specified dimensional requirements shall be used in place of cast iron.
- D. Where high-heel-proof grate is called for on the Drawings, the grate shall be specifically manufactured for that purpose. Grate retrofitted with perforated plate is not acceptable.
- E. Where catch basin or other drainage structure is to be constructed with solid cover, cover shall be supplied with diamond tread non-slip surface.
- F. In all cases, grates and frames shall be galvanized and supplied with at least two (2) Stainless Steel Allen-head capscrews connecting grate to frame to prevent vandalism. When tightened in place, top of capscrew shall not protrude above surface of grate or frame.

Solid covers and frames shall be galvanized only if structure is located in concrete flatwork area.

- G. These requirements apply to all drainage structures, whether detailed on the Drawings or referenced.

2.05 RIP RAP / CHECK DAMS / SPLASH PADS

A. ROCK

1. Rock for check dams, splash pads and rip rap shall be angular quarry stone and shall be sound, durable, hard, resistant to abrasion and free from laminations, weak cleavage planes, and the undesirable effects of weathering; it shall be of such character that it will not disintegrate from the action of air, water, or the conditions to be met in handling and placing.
2. All rock material shall be clean and free from deleterious impurities, including alkali, earth, clay, refuse and adherent coatings.

B. GROUT

1. Cement grout for check dams, splash pads and rip rap, where called for on the plans, shall be fine grout conforming to ASTM Standard C476, latest revision, and shall attain minimum compressive strength of 2000 PSI in 28 days. Slump shall be 8 to 11 inches.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Before beginning work, determine or verify the location and flowline elevation of all existing drainage structures and pipes to be joined by new construction.
- B. Before beginning work, verify that excavation will not take place below a line projected downward at a 2 horizontal to 1 vertical slope from a point 9 inches above the bottom of existing or proposed structure foundations adjacent to the work; if proposed excavation / foundation geometry is determined to be contrary to this requirement, request direction from Owner's Representative before proceeding with the work.
- C. Employ a Licensed Surveyor to provide line and grade control stakes for construction of storm drain facilities, to survey locations of existing facilities to be joined by or which may interfere with new construction, and to provide conformation during construction that facilities are at required line and grade.

3.02 EXCAVATION EXAMINATION

- A. Verify that excavation dimensions and elevations are as indicated on the Drawings, including due allowance for required thickness of bedding material, and that the excavation is ready to receive storm drainage structure and/or pipeline work.

- B. Verify that excavation finish subgrade condition has been reviewed and approved by the Construction-Phase Geotechnical Engineer.

3.03 EXCAVATION PREPARATION

- A. Hand trim excavations if required for conformance with dimensions and elevations indicated on the Drawings. Remove excess material.

3.04 CATCH BASINS

- A. Have approved grates or covers and frames on-site before forming cast-in-place drainage structures.
- B. Construct cast-in-place and pre-cast concrete drainage structures in accordance with the Drawing details or Reference Details to the lines and grades and dimensions indicated on the Drawings. Catch basins shall be placed such that grates are aligned to match (parallel to) adjacent structures.
- C. Install full circumference water stops around pipe penetrations in both cast-in-place and pre-cast structure walls.
- D. Configure the bottoms of both cast-in-place and pre-cast drainage structures to provide positive drainage to the flowline of the outlet pipe so as to prevent ponding.

3.05 RIP RAP/CHECK DAMS / SPLASH PADS

- A. Perform grading operations as necessary to construct subgrade to required line, grade and compaction density.
- B. Hand trim excavation if required for conformance with dimensions and elevations indicated on the Drawings. Remove excess material.
- C. Request observation and testing of subgrade condition by Construction-Phase Geotechnical Engineer; do not place geotextile fabric or rock until subgrade has been approved.
- D. Place geotextile fabric (where called for) and rock in accordance with the Drawings.
- E. Where rock is to be grouted, hold grout level down or back 3 inches from exposed rock surface.

3.06 FIELD QUALITY CONTROL

- A. Request inspection by Owner's Representative after forming and placing reinforcing steel for cast-in-place drainage structures, and placing pipe with waterstop at wall penetrations, but before scheduling the concrete pour.

- B. Before construction of pavement, walkways and other permanent surface improvements, provide a construction record drawing of the system prepared by a California Registered Land Surveyor to include top of grate or solid cover and inlet and outlet invert elevations of all storm drain structures, whether located in hard surfaced or in dirt / landscaped areas. Elevation measurements shall be accurate to 0.01 foot.
- C. Before construction of pavement, walkways and other permanent surface improvements, perform Water Exfiltration Test on storm drain piping and structures per SSPWC Section 306-1.4.2 except that "sewer" shall mean storm drain, "manhole" shall mean catch basin, water test level shall be 4 feet above catch basin invert or to top of frame level, whichever is less, and test period shall be 4 hours.
- D. Upon completion of construction of the storm drain system and with 48 hours' notice to Owner's Representative, thoroughly clean and wash-down all inlets and storm drain piping. Immediately after cleaning, perform mandrel testing of PVC storm drains in accordance with Section 306-1.2.12 of the SSPWC.
- E. ACCEPTABLE TOLERANCES:
1. Top-of-Grate: $\frac{1}{2}$ inch (0.04 foot) maximum deviation above or below design elevation in dirt surface.
 $\frac{1}{4}$ inch (0.02 foot) maximum deviation above or below design elevation in concrete or A.C. pavement surfacing.
 2. Structure invert: $\frac{1}{2}$ inch (0.04 foot) deviation above or below design elevation and no standing water in structure or upstream pipe.
 3. Pipe Invert: $\frac{1}{2}$ inch (0.04 foot) maximum deviation above or below design elevation at any location or 10 percent of design slope over any reach, whichever is less, and no standing water.
 4. In all such cases, deviations within the specified tolerances shall be compensating such that the average design slopes and elevations conform to those specified per plan.

3.09 SUBMITTAL REQUIREMENTS AND SCHEDULE

- A. Include this form with submittals of this Specification Section, unless a substitute product is being proposed, in which case refer to Division 1, "Substitutions" section, for substitution requests.

Contractor's [Contractor is to acknowledge with initials each submittal included]
Initials:_____

_____ Letter of explanation attached for each submittal not included.

_____ All submitted products are as specified.

B. SUBMITTAL SCHEDULE

- _____ 1. Submit manufacturer's product data for grates, solid covers and frames for drainage structures.
- _____ 2. Submit manufacturer's product data for waterstop to be used for pipe connections at drainage structures.
- _____ 3. Submit concrete mix design for each class of concrete and grout required.

END OF SECTION