

# PROJECT MANUAL

Book 2 of 2

## Tokay High School Site - Increment 1

1111 Century Boulevard  
Lodi, CA 95240

### DSA Final

October 28, 2019  
DSA # 02-117806

Developed For:  
**Lodi Unified School District**

Project No. 0947-8247-1

1305 E. Vine Street  
Lodi, CA 95240

Volume 1 of 1

Divisions 01-33

LPA Project No. 18180.10



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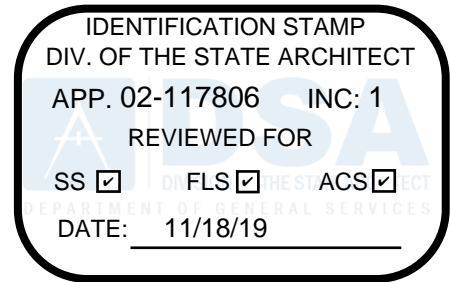
**SECTION 000002 - PROJECT DIRECTORY**

Owner:

**LODI UNIFIED SCHOOL DISTRICT**  
1305 E. Vine Street  
Lodi, CA 95240  
T- 209.331.7000

Contact:  
Leonard Kahn  
CBO

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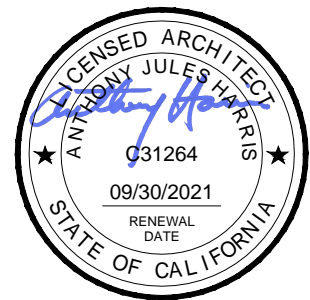


Architect:

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F- 916.772.4330

Contact:  
Anthony Harris, #C31264  
Architect of Record

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(Seal)

Civil Engineer:

**LPA, INC.**  
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Sacramento, CA 95814  
T- 916.287.2400  
F- 916.772.4330

Contact:  
Kathereen Shinkai, RCE #68369  
Civil Engineer of Record

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10/24/19

(Seal)

Landscape Architect:

**LPA Inc.**  
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Contact:  
Corrie Lindsay, #5955  
Landscape Architect of Record

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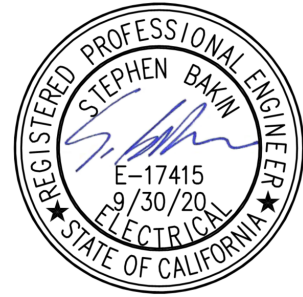
Electrical Engineer:

**LPA, INC.**

5161 California Ave, Suite 100  
Irvine, CA 92617  
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F- 949.260.1190

Contact:  
Steve Bakin, #E-17415  
Electrical Engineer of Record

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(Seal)

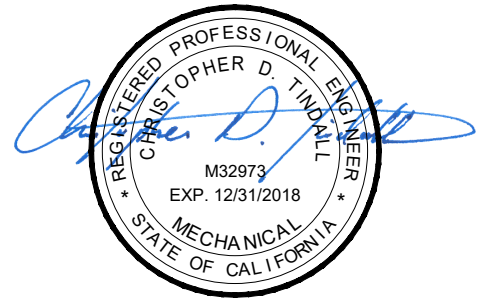
Mechanical Engineer:

**LPA, INC.**

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F- 949.260.1190

Contact:  
Christopher Tindall, #M32973  
Mechanical Engineer of Record

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(Seal)

**END OF SECTION**

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END OF DOCUMENT

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## SECTION 011000 SUMMARY

### PART 1 GENERAL

#### 1.01 PROJECT

- A. Project Name: Tokay HS Site - Increment 1
- B. Owner's Name: Lodi USD.
- C. Architect's Name: LPA Inc.

#### 1.02 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Owner intends to occupy a certain portion of the Project prior to the completion date for the conduct of normal operations.
- C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- D. Schedule the Work to accommodate Owner occupancy.

#### 1.03 CONTRACTOR USE OF SITE AND PREMISES

- A. Arrange use of site and premises to allow:
  - 1. Owner occupancy.
  - 2. Work by Others.
- B. Provide access to and from site as required by law and by Owner:
  - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
  - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- C. Utility Outages and Shutdown:
  - 1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
  - 2. Limit shutdown of utility services to two hours at a time, arranged at least 24 hours in advance with Architect.
  - 3. Prevent accidental disruption of utility services to other facilities.
- D. Controlled Substances: Use of tobacco products and other controlled substances on the Project site is not permitted.

#### 1.04 WORK SEQUENCE

- A. Construct Work in stages during the construction period:
  - 1. Refer to Responsibility Matrix for Increment 2 scope of work coordination with work performed in Increment 3.
- B. Coordinate construction schedule and operations with Owner.

### PART 2 PRODUCTS - NOT USED

### PART 3 EXECUTION - NOT USED

**END OF SECTION**



DOCUMENT 01 11 00

**SUMMARY OF WORK**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS AND PROVISIONS**

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Site Access Conditions and Requirements;
- B. Special Conditions.

**1.02 SUMMARY OF WORK COVERED BY CONTRACT DOCUMENTS**

- A. The Work of this Contract consists of the following:
  - (1) Initial sitework, including building pads
  - (2) Removal of (20) existing portable classrooms
  - (3) Remaining sitework, including final grading/hardscape/landscape/irrigation, paving/fire access roads.

**1.03 CONTRACTS**

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

**1.04 WORK BY OTHERS**

- A. Work on the Project that will be performed and completed prior to the start of the Work of this Contract:
  - (1) Not Used.
- B. Work on the Project that will be performed by others concurrent with the Work of this Contract:
  - (1) Installation of modular classroom building (Increment II)
  - (2) Installation of modular gymnasium building (Increment III)

**1.05 CODES, REGULATIONS, AND STANDARDS**

- A. The codes, regulations, and standards adopted by the state and federal agencies having jurisdiction shall govern minimum requirements for this Project. Where codes, regulations, and standards conflict with the Contract Documents, these conflicts shall be brought to the immediate attention of the District and the Architect.

- B. Codes, regulations, and standards shall be as published effective as of date of bid opening, unless otherwise specified or indicated.

#### **1.06 PROJECT RECORD DOCUMENTS**

- A. Contractor shall maintain on Site one set of the following record documents; Contractor shall record actual revisions to the Work:
  - (1) Contract Drawings.
  - (2) Specifications.
  - (3) Addenda.
  - (4) Change Orders and other modifications to the Contract.
  - (5) Reviewed shop drawings, product data, and samples.
  - (6) Field test records.
  - (7) Inspection certificates.
  - (8) Manufacturer's certificates.
- B. Contractor shall store Record Documents separate from documents used for construction. Provide files, racks, and secure storage for Record Documents and samples.
- C. Contractor shall record information concurrent with construction progress.
- D. Specifications: Contractor shall legibly mark and record at each product section of the Specifications the description of the actual product(s) installed, including the following:
  - (1) Manufacturer's name and product model and number.
  - (2) Product substitutions or alternates utilized.
  - (3) Changes made by Addenda and Change Orders and written directives.

#### **1.07 EXAMINATION OF EXISTING CONDITIONS**

- A. Contractor shall be held to have examined the Project Site and acquainted itself with the conditions of the Site and of the streets or roads approaching the Site.
- B. Prior to commencement of Work, Contractor shall survey the Site and existing buildings and improvements to observe existing damage and defects such as cracks, sags, broken, missing or damaged glazing, other building elements and Site improvements, and other damage.
- C. Should Contractor observe cracks, sags, and other damage to and defects of the Site and adjacent buildings, paving, and other items not indicated in the

Contract Documents, Contractor shall immediately report same to the District and the Architect.

#### **1.08 CONTRACTOR'S USE OF PREMISES**

- A. If unoccupied and only with District's prior written approval, Contractor may use the building(s) at the Project Site without limitation for its operations, storage, and office facilities for the performance of the Work. If the District chooses to beneficially occupy any building(s), Contractor must obtain the District's written approval for Contractor's use of spaces and types of operations to be performed within the building(s) while so occupied. Contractor's access to the building(s) shall be limited to the areas indicated.
- B. If the space at the Project Site is not sufficient for Contractor's operations, storage, office facilities and/or parking, Contractor shall arrange and pay for any additional facilities needed by Contractor.
- C. Contractor shall not interfere with use of or access to occupied portions of the building(s) or adjacent property.
- D. Contractor shall maintain corridors, stairs, halls, and other exit-ways of building clear and free of debris and obstructions at all times.
- E. No one other than those directly involved in the demolition and construction, or specifically designated by the District or the Architect shall be permitted in the areas of work during demolition and construction activities.
- F. The Contractor shall install the construction fence and maintain that it will be locked when not in use. Keys to this fencing will be provided to the District.

#### **1.09 PROTECTION OF EXISTING STRUCTURES AND UTILITIES**

- A. The Drawings show above-grade and below-grade structures, utility lines, and other installations that are known or believed to exist in the area of the Work. Contractor shall locate these existing installations before proceeding with excavation and other operations that could damage same; maintain them in service, where appropriate; and repair damage to them caused by the performance of the Work. Should damage occur to these existing installations, the costs of repair shall be at the Contractor's expense and made to the District's satisfaction.
- B. Contractor shall be alert to the possibility of the existence of additional structures and utilities. If Contractor encounters additional structures and utilities, Contractor will immediately report to the District for disposition of same as indicated in the General Conditions.

#### **1.10 UTILITY SHUTDOWNS AND INTERRUPTIONS**

- A. Contractor shall give the District a minimum of three (3) days written notice in advance of any need to shut off existing utility services or to effect equipment interruptions. The District will set exact time and duration for shutdown, and will assist Contractor with shutdown. Work required to re-establish utility services shall be performed by the Contractor.

- B. Contractor shall obtain District's written approval as indicated in the General Conditions in advance of deliveries of material or equipment or other activities that may conflict with District's use of the building(s) or adjacent facilities.

**1.11 STRUCTURAL INTEGRITY**

- A. Contractor shall be responsible for and supervise each operation and work that could affect structural integrity of various building elements, both permanent and temporary.
- B. Contractor shall include structural connections and fastenings as indicated or required for complete performance of the Work.

**PART 2 – PRODUCTS Not Used.**

**PART 3 – EXECUTION Not Used.**

END OF DOCUMENT

## DOCUMENT 01 21 00

**ALLOWANCE****PART 1 GENERAL****1.1 SECTION INCLUDES**

A. Non-specified work.

**1.2 RELATED SECTIONS**

A. Document 01 10 00 (Summary of Work)

B. Document 01 29 00 (Payments and Completion)

C. Document 01 32 19 (Submittal Procedures)

**1.3 ALLOWANCES**

A. Included in the Contract, a stipulated sum/price of **\$475,000.00** for allowances #1-#5 as listed below, within the limits set forth in the Bridging Documents. This Allowance shall not be utilized without written approval by the District.

<b>Tokay High School (0947-8247-1), Allowance #1:</b> Allowance for unforeseen conditions at Tokay High School.	\$250,000.00
<b>Tokay High School (0947-8247-1), Allowance #2:</b> Allowance for Soil/Lime Treatment at Classroom (Increment II).	\$75,000.00
<b>Tokay High School (0947-8247-1), Allowance #3:</b> Allowance for Soil/Lime Treatment at Gym (Increment III).	\$75,000.00
<b>Tokay High School (0947-8247-1), Allowance #4:</b> Allowance for Temporary Power at Classroom (Increment II).	\$60,000.00
<b>Tokay High School (0947-8247-1), Allowance #5:</b> Allowance for Temporary Power at Gym (Increment II).	\$15,000.00

B. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding and equipment rental will be included in Allowance Expenditure Directive authorizing expenditure of funds from this Allowance.

C. Funds will be drawn from Allowance only with District approval evidenced by an Allowance Expenditure Directive.

D. At Contract closeout, funds remaining in Allowance will be credited to District by Change Order.

**PART 2 PRODUCTS**

Lodi Unified School District

Site – Increment I  
Tokay High School

Not used.

**PART 3 EXECUTION**

Not used.

END OF DOCUMENT

## DOCUMENT 01 22 00

**ALTERNATES AND UNIT PRICING****PART 1 – ALTERNATES****1.01 RELATED DOCUMENTS AND PROVISIONS**

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions;
- C. Bid Form and Proposal;
- D. Instruction to Bidders.

**1.02 DESCRIPTION**

The items of work indicated below propose modifications to, substitutions for, additions to and/or deletions from the various parts of the Work specified in other Sections of the Specifications. The acceptance or rejection of any of the alternates is strictly at the option of the District subject to District's acceptance of Contractor's stated prices contained in this Proposal.

**1.03 GENERAL**

Where an item is omitted, or scope of Work is decreased, all Work pertaining to the item whether specifically stated or not, shall be omitted and where an item is added or modified or where scope of Work is increased, all Work pertaining to that required to render same ready for use on the Project in accordance with intention of Drawings and Specifications shall be included in an agreed upon price amount.

**1.04 BASE BID**

The Base Bid includes all work required to construct the Project completely and in accordance with the Contract Documents.

**1.05 ALTERNATES**

- A. Not Used.

The above Alternate descriptions are general in nature and for reference purposes only. The Contract Documents, including, without limitation, the Drawings and Specifications, must be referred to for the complete scope of Work.

## **PART 2 - UNIT PRICING**

### **2.01 GENERAL**

Contractor shall completely state all required figures based on Unit Prices listed below. Where scope of Work is decreased, all Work pertaining to the item, whether specifically stated or not, shall be omitted and where scope of Work is increased, all work pertaining to that item required to render same ready for use on the Project in accordance with intention of Drawings and Specifications shall be included in an agreed upon price amount.

### **2.02 UNIT PRICES**

Furnish unit prices for each of the named items on a square foot, lineal foot, or per each basis, as applies. Unit prices shall include all labor, materials, services, profit, overhead, insurance, bonds, taxes, and all other incidental costs of Contractor, subcontractors, and supplier(s).

A. Not Used.

END OF DOCUMENT



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## SECTION 012500 SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.

#### 1.02 RELATED SECTIONS

- A. Section 016000 - Product Requirements, for submittal procedures and contract document revisions initiated by Contractor.

#### 1.03 DEFINITIONS

- A. Project Completion: Final Completion, unless otherwise indicated.
- B. 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.
    - a. Substitutions for Convenience shall include any comparable ("or equivalent") product, including proposed changes to named products, proposed changes to listed manufacturers and proposed changes to basis-of-design products, unless a Substitution for Cause regarding the comparable products can be properly demonstrated by the Contractor.

#### 1.04 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 appropriate form provided in the Project Manual.
  - 2. Documentation: Submit the information indicated below to provide the Architect with the minimum information necessary to fairly review and evaluate the proposed substitutions, proposed comparable products and proposed changes to specified products. Show compliance with requirements and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    - b. Coordination information which will be necessary to accommodate proposed substitution, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors.
    - c. Detailed side by side 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.

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- e. Samples and mock-ups, 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 or other code organizations acceptable to authorities having jurisdiction.
  - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within fourteen days of receipt of request, or within fourteen days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order or Construction Change Directive. Architect's Supplemental Instructions may be used 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.

#### 1.05 QUALITY ASSURANCE

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

#### 1.06 PROCEDURES

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

### PART 2 - PRODUCTS

#### 2.01 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than fourteen 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

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will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - b. Substitution request is fully documented and properly submitted.
  - c. Requested substitution will not adversely affect Contractor's construction schedule.
  - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
  - e. Requested substitution is compatible with other portions of the Work.
  - f. Requested substitution has been coordinated with other portions of the Work.
  - g. Requested substitution provides specified warranty.
  - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 35 days after the Notice of Award. 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. Substitution request is fully documented and properly submitted.
    - e. Requested substitution will not adversely affect Contractor's construction schedule.
    - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - g. Requested substitution is compatible with other portions of the Work.
    - h. Requested substitution has been coordinated with other portions of the Work.
    - i. Requested substitution provides specified warranty.
    - j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

### **PART 3 - EXECUTION (NOT USED)**

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**END OF SECTION 012500.00**

**SUBSTITUTION REQUEST - FORM "A"**  
- For use during BIDDING period -



<b>Project Name:</b>		<b>Job No.</b>	
		<b>Date:</b>	
<b>To: Architect:</b> LPA, Inc.	<b>Contractor:</b>		
<b>Specified Item:</b>			
<b>Specification Section</b>	<b>Paragraph No.</b>	<b>Drawing No.</b>	<b>Detail No.</b>
<b>Contractor's Proposed Substitution:</b>			
<b>Reason For Request:</b> _____ _____			
<b>Manufacturer:</b> _____			
<b>Manufacturer Contact:</b> _____			
<b>Manufacturer Telephone:</b> _____			
<b>Trade Name and Model:</b> _____			
<b>History:</b> <input type="checkbox"/> New Product <input type="checkbox"/> 1-4 years in market <input type="checkbox"/> 5-10 years in market <input type="checkbox"/> over 11 years in market			
<b>Mandatory for Consideration: Specification Section 012500– Substitution Procedures</b>			
<input type="checkbox"/> Drawings <input type="checkbox"/> Product Data <input type="checkbox"/> Samples <input type="checkbox"/> Test Data <input type="checkbox"/> Reports <input type="checkbox"/> Other _____			
Attach a <b>Point-by-Point Comparison</b> between proposed product and product indicated. Provide complete data for proposed product, including product / material descriptions, specifications, drawings, photographs, performance, MSDS data sheet and test data adequate for evaluation of the request. Clearly annotate applicable portions of the data. Include ICC Evaluation Service (ICC ES) Evaluation Report, if applicable.			
The Undersigned certifies: - Proposed substitution has been fully investigated and determined to be equivalent or superior in all respects to specified product. - Proposed substitution complies with applicable Codes, ordinances and standards. - Proposed substitution complies with Contract requirements. - Same warranty will be furnished for proposed substitution as for specified products. - Same maintenance service and source of replacement parts, as applicable, are available. - Proposed substitution will have no adverse effect on related Work and will not affect or delay progress of the Work. - Proposed substitution does not affect dimensions and functional clearances. - Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.			
<b>Submitted by: (name)</b> _____		<b>Title:</b> _____	
<b>Signed:</b> _____		<b>Date:</b> _____	

**SUBSTITUTION REQUEST - FORM "A"**  
- For use during BIDDING period -



**Architect's Recommended Action:**

- ☐ **Approved.** Refer to Addendum # \_\_\_\_\_
- ☐ **Approved As Noted.** Refer to Addendum # \_\_\_\_\_
- ☐ Proposed substitution SUBJECT to receive approval by Division of the State Architect (DSA) for compliance with applicable provisions of California Code of Regulations (CCR), Title 24 of the California Building Standards Code (CBSC).
- ☐ **Rejected - Use specified product / materials.**
- ☐ **Request received too late - Use specified product / materials.**
- ☐ **Request does not have DSA approval - Use specified product / materials.**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Remarks: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**SUBSTITUTION REQUEST - FORM "B"**  
- For use AFTER execution of Contract -



<b>Project Name:</b> Tokay HS Site - Increment 1		<b>LPA Inc. Job No.</b> 18180.10	
		<b>Substitution No.</b>	
<b>To: LPA Inc.</b>		<b>Contractor:</b>	
<b>Specified Item:</b>			
<b>Specification Section</b>	<b>Paragraph No.</b>	<b>Drawing No.</b>	<b>Detail No.</b>
<b>Contractor's Proposed Substitution:</b>			
<b>Reason For Request:</b> _____ _____			
<b>Manufacture:</b> _____			
<b>Manufacturer Contact:</b> _____			
<b>Manufacturer and Telephone:</b> _____			
<b>Trade Name and Model:</b> _____			
<b>Mandatory for Consideration:</b> (Specification Section 012500 – Substitution Procedures)			
<input type="checkbox"/> Drawings <input type="checkbox"/> Product Data <input type="checkbox"/> Samples <input type="checkbox"/> Test Data <input type="checkbox"/> Reports <input type="checkbox"/> Other _____			
Attach a <b>Point-by-Point comparison against detailed and specified products</b> with complete data, including product / material descriptions, specifications, drawings, photographs, performance, MSDS data sheet and test data adequate for evaluation of the request. Clearly annotate applicable portions of the data. Include ICC Evaluation Service (ICC ES) Evaluation Report, if applicable.			
The Undersigned certifies: <ul style="list-style-type: none"><li>- Proposed substitution has been fully investigated and determined to be equivalent or superior in all respects to specified product.</li><li>- Proposed substitution complies with applicable Codes, ordinances and standards.</li><li>- Same warranty will be furnished for proposed substitution as for specified products.</li><li>- Same maintenance service and source of replacement parts, as applicable, are available.</li><li>- Proposed substitution will have no adverse effect on related Work and will not affect or delay progress of the Work.</li><li>- Proposed substitution does not affect dimensions and functional clearances.</li><li>- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.</li></ul>			
<b>Submitted by: (name)</b> _____		<b>Title:</b> _____	
<b>Signed:</b> _____		<b>Date:</b> _____	

**Architect's Recommended Action:**

- ☐ **Approved.** Refer to Change Order #\_\_\_\_
- ☐ **Approved As Noted.** Refer to Change Order # \_\_\_\_
- ☐ **Rejected - Use specified product / materials.**

**Name:**\_\_\_\_\_ **Date:**\_\_\_\_\_

**Remarks:**\_\_\_\_\_

\_\_\_\_\_



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## SECTION 012600 CONTRACT MODIFICATION PROCEDURES

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
  - 1. Division 01 Sections "Substitution Procedures" for administrative procedures for handling requests for substitutions made after Contract award.

#### 1.02 MINOR CHANGES IN THE WORK

- A. Architect may issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on the following form:
  - 1. AIA Document G710, "Supplemental Instructions" or similar form acceptable to the Architect.

#### 1.03 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. 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 twenty 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 form 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.

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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 Division 01 Section "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.

#### 1.04 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701, or similar form.

#### 1.05 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714 or similar form. 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: Unless otherwise directed, provide detailed change pricing prior to actual change in Work. When directed, and when change pricing cannot be completed and agreed prior to actual change in Work, maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  1. Submit an itemized account and supporting data necessary to substantiate cost adjustments to the Contract.
    - 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 required or requested, furnish survey data to substantiate quantities.
      - 1) Provide invoices and billing statements supporting material and labor costs.
    - 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.
      - 1) Provide copies of detailed daily reports, verified by Project inspector, or accepted third party, supporting labor and supervision costs.
    - d. Include overhead and profit itemization.
      - 1) Overhead and profit shall not exceed 10% for work directly self-performed by Subcontractor.
      - 2) Overhead and profit shall not exceed 5% for any work not directly self-performed by Contractor.
    - e. Include bond costs where change amount causes Contract Sum to exceed bonded amount.
      - 1) Bond costs shall not exceed 1.5% of the proposed cost adjustment.

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2. Submit an itemized account and supporting data necessary to substantiate time adjustments to the Contract.
  - a. 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.

**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**

#### **1.01 SUMMARY**

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
  - 1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
  - 3. Division 01 Section "Submittal Procedures" for administrative requirements governing the preparation and submittal of the submittal schedule.

#### **1.02 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.

#### **1.03 SCHEDULE OF VALUES**

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
  - 1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with continuation sheets.
    - b. Submittal schedule.
    - c. 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 ten days before the date scheduled for submittal of initial Application for Payment.
  - 3. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract as described in Division 01 Section "Summary."
- B. Format and Content: Use the 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. Provide additional detail as required or requested.
  - 1. Identification: Include the following Project identification on the schedule of values:
    - a. Project name and location.
    - b. Name of Architect.
    - c. Architect's project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  - 2. Arrange schedule of values consistent with format of AIA Document G703.

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3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
  - a. Item number.
  - b. Description of the Work.
  - c. Dollar value.
    - 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. Coordinate with the Project Manual table of contents. Provide at least two line items for principal subcontract amounts in excess of five percent of Contract Sum, as follows:
  - a. Labor
  - b. Equipment and material.
5. Include separate line items under Division 01 heading for prime contract and principal subcontracts for project closeout requirements in an amount of at least five percent of the Contract Sum and subcontract amounts.
6. Round all amounts to nearest whole dollar; total shall equal the Contract Sum.
7. 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.
8. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
9. 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.
10. 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.
11. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
12. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

#### 1.04 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

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1. Initial Application for Payment, Application for Payment at time of Project Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Progress payments shall be submitted to Architect by the twenty-fifth day of the month. 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.
- D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 or similar form acceptable to Architect as form for Applications for Payment.
- E. Application for Payment Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included in the Project Manual.
- F. Application for Payment Forms: Use forms acceptable to Architect and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.
- G. 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.
- H. Transmittal: Submit five signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. Owner's copy shall include waivers of lien and similar attachments.
  1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- I. 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. Waiver Forms: Submit waivers of lien on forms complying with California law, executed in a manner acceptable to Owner.

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- J. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
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 waivers of lien on forms, executed in a manner acceptable to Owner.
- K. 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 principal consultants.
  6. Copies of building permits.
  7. Initial progress report.
  8. Report of preconstruction conference.
- L. Application for Payment at Project Completion: Submit an Application for Payment showing 100 percent completion for portion of the Work claimed as complete.
1. Include documentation supporting claim that the Work is complete and a statement showing an accounting of changes to the Contract Sum.
  2. This application shall reflect any Certificates of Partial Project Completion issued previously for Owner occupancy of designated portions of the Work.
- M. 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. Final, unconditional lien releases (in exchange for final payment).
  5. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
  6. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
  7. AIA Document G707, "Consent of Surety to Final Payment."
  8. Evidence that claims have been settled.

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9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Project Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
10. Final liquidated damages settlement statement.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION 012900.00**



**CONDITIONAL WAIVER AND RELEASE  
ON PROGRESS PAYMENT**  
(CIVIL CODE SECTION 8132)

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Name of Claimant: \_\_\_\_\_

Name of Customer: \_\_\_\_\_

Job Location: \_\_\_\_\_

Owner: \_\_\_\_\_

Through Date: \_\_\_\_\_

**Conditional Waiver and Release**

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check: \_\_\_\_\_

Amount of Check: \$\_\_\_\_\_

Check Payable to: \_\_\_\_\_

**Exceptions**

This document does not affect any of the following:

- (1) Retentions.
- (2) Extras for which the claimant has not received payment.
- (3) The following progress payments for which the claimant has previously given a conditional waiver and release but has not received payment:

Date(s) of waiver and release: \_\_\_\_\_

Amount(s) of unpaid progress payment(s): \$\_\_\_\_\_

- (4) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Claimant's Signature: \_\_\_\_\_

Claimant's Title: \_\_\_\_\_

Date of Signature: \_\_\_\_\_

**UNCONDITIONAL WAIVER AND RELEASE  
ON PROGRESS PAYMENT**  
(CIVIL CODE SECTION 8134)

NOTICE TO CLAIMANT: THIS DOCUMENT WAIVES AND RELEASES LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL WAIVER AND RELEASE FORM.

Name of Claimant: \_\_\_\_\_

Name of Customer: \_\_\_\_\_

Job Location: \_\_\_\_\_

Owner: \_\_\_\_\_

Through Date: \_\_\_\_\_

**Unconditional Waiver and Release**

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. The claimant has received the following progress payment: \$\_\_\_\_\_

**Exceptions**

This document does not affect any of the following:

- (1) Retentions.
- (2) Extras for which the claimant has not received payment.
- (3) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Claimant's Signature: \_\_\_\_\_

Claimant's Title: \_\_\_\_\_

Date of Signature: \_\_\_\_\_

**CONDITIONAL WAIVER AND RELEASE  
ON FINAL PAYMENT**  
(CIVIL CODE SECTION 8136)

**NOTICE:** THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Name of Claimant: \_\_\_\_\_

Name of Customer: \_\_\_\_\_

Job Location: \_\_\_\_\_

Owner: \_\_\_\_\_

**Conditional Waiver and Release**

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check:

Amount of Check: \$\_\_\_\_\_

Check Payable to: \_\_\_\_\_

**Exceptions**

This document does not affect any of the following: \_\_\_\_\_

Disputed claims for extras in the amount of: \$\_\_\_\_\_

Claimant's Signature: \_\_\_\_\_

Claimant's Title: \_\_\_\_\_

Date of Signature: \_\_\_\_\_

**UNCONDITIONAL WAIVER AND RELEASE  
ON FINAL PAYMENT**  
(CIVIL CODE SECTION 8138)

**NOTICE TO CLAIMANT:** THIS DOCUMENT WAIVES AND RELEASES LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL WAIVER AND RELEASE FORM.

Name of Claimant: \_\_\_\_\_

Name of Customer: \_\_\_\_\_

Job Location: \_\_\_\_\_

Owner: \_\_\_\_\_

**Unconditional Waiver and Release**

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for all labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. The claimant has been paid in full.

**Exceptions**

This document does not affect any of the following: \_\_\_\_\_

Disputed claims for extras in the amount of: \$\_\_\_\_\_

Claimant's Signature: \_\_\_\_\_

Claimant's Title: \_\_\_\_\_

Date of Signature: \_\_\_\_\_

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## SECTION 013100 PROJECT MANAGEMENT AND COORDINATION

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General project coordination procedures.
  - 2. Coordination drawings.
  - 3. Requests for Information (RFIs).
  - 4. Project meetings.
- B. Related Requirements:
  - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
  - 2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

#### 1.02 DEFINITIONS

- A. Project Completion: Final Completion, unless otherwise indicated.
- B. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information from each other during construction.

#### 1.03 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, and telephone number 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.
  - 4. 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 and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

#### 1.04 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.

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2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities 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.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
  1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

#### 1.05 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
  1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Prepare coordination drawings to comply with accepted industry drafting standards. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    - a. Applicable Drawings may be used as a basis for preparation of coordination drawings, provide title blocks, stamps and certifications are removed. Prepare additional sections, elevations, and details as needed to describe relationship of various systems and components.
      - 1) Provide review stamp, with signature and date, of each trade proposed to work within the opening or penetration
    - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.

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- 1) Provide review stamp, with signature and date, of each contractor and trade proposed to work within the opening or penetration.
  - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - 1) Grid lines and levels, and references to appropriate Contract drawings.
    - 2) Location and dimensions of openings and penetrations.
  - d. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
  - e. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
  - f. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
  - g. Indicate required installation sequences.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
  2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
  4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
    - a. Include all items located within the opening or penetration, and dimensioned clearance to edge of penetration. Include framing, equipment, suspension systems, piping, ductwork, cable systems and other construction. Include insulation, supports, clamps, sealants and accessory items.
  5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
  6. Mechanical and Plumbing Work: Show the following:
    - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    - c. Fire-rated enclosures around ductwork.
  7. Electrical Work: Show the following:
    - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) diameter and larger.



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- b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
  - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
  - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
- 8. Fire Protection System: Show the following:
  - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
- 9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Architect determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Architect will so inform the Contractor, who shall make changes as directed and resubmit.
- 10. Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Division 01 Section "Submittal Procedures."
- C. Coordination Digital Data Files: At Contractor's option, prepare coordination digital data files in accordance with the requirements of Division 01 Section "Submittal Procedures."
  - 1. File Preparation Format: DWG, Version , operating in Microsoft Windows operating system.

#### 1.06 REQUESTS FOR INFORMATION (RFIS)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
  - 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
  - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
  - 1. Project name.
  - 2. Project number.
  - 3. Date.
  - 4. Name of Contractor.
  - 5. Name of Architect and Construction Manager.
  - 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 solution(s) 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, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe

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items needing interpretation.

- a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
  - b. Photographs shall not be accepted as a substitute for engineering sketches. Photographs may be submitted as supplements to properly prepared sketches and coordination drawings.
- C. RFI Forms: Form bound in the Project Manual, or other software-generated form with substantially the same content as indicated above, acceptable to Architect and Construction Manager.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect or Construction Manager after 1:00 p.m. will be considered as received the following working day.
1. The following 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 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 Division 01 Section "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within seven days of receipt of the RFI response.
  4. Name and address of Architect and Construction Manager.
  5. Date Architect's and Construction Manager's response was received.
- E. On receipt of Architect's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
  2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. Upon completion of Project, submit three complete archive copies of Project Web site files to Owner, Construction Manager and to Architect in a digital storage format acceptable to the Architect.

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- G. Contractor, subcontractors, and other parties granted access by the Contractor to project Web site shall execute a data licensing agreement in the form of an Agreement acceptable to the Owner, Construction Manager and Architect.

#### 1.07 PROJECT MEETINGS

- A. General: Construction Manager will schedule and conduct basic meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Entity responsible for conducting meeting will inform participants and others involved, and individuals whose presence is required, of date and time of each meeting.
  2. Agenda: Entity responsible for conducting meeting will prepare and distribute the meeting agenda.
  3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved, and distribute the meeting minutes to everyone concerned, within seven days of the meeting.
- B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than fifteen days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
  2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Lines of communications.
    - f. Procedures for processing field decisions and Change Orders.
    - g. Procedures for RFIs.
    - h. Procedures for testing and inspecting.
    - i. Procedures for processing Applications for Payment.
    - j. Distribution of the Contract Documents.
    - k. Submittal procedures.
    - l. Sustainable design requirements.
    - m. Preparation of record documents.
    - n. Use of the premises.
    - o. Work restrictions.
    - p. Working hours.
    - q. Owner's occupancy requirements.
    - r. Responsibility for temporary facilities and controls.

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- s. Procedures for moisture and mold control.
- t. Procedures for disruptions and shutdowns.
- u. Construction waste management and recycling.
- v. Parking availability.
- w. Office, work, and storage areas.
- x. Equipment deliveries and priorities.
- y. First aid.
- z. Security.
- aa. Progress cleaning.
- bb. Labor law, including payment and reporting requirements.
- 4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Contractor shall conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
  - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting.
    - a. Advise the following of scheduled meeting dates:
      - 1) Construction Manager
  - 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. Sustainable design requirements.
    - i. Review of mockups.
    - j. Possible conflicts.
    - k. Compatibility problems.
    - l. Time schedules.
    - m. Weather limitations.
    - n. Manufacturer's written recommendations.
    - o. Warranty requirements.
    - p. Compatibility of materials.
    - q. Acceptability of substrates.
    - r. Temporary facilities and controls.
    - s. Space and access limitations.

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- t. Regulations of authorities having jurisdiction.
  - u. Testing and inspecting requirements.
  - v. Installation procedures.
  - w. Coordination with other work.
  - x. Required performance results.
  - y. Protection of adjacent work.
  - z. 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: The project closeout conference shall review requirements and responsibilities related to Project closeout.
  - 1. If not conducted as part of a normally scheduled job progress meeting, Construction Manager will schedule and conduct a Project closeout conference, at a time convenient to Owner, Architect and Contractor, but no later than thirty days prior to the scheduled date of Project Completion.
  - 2. Attendees: Authorized representatives of Owner, Architect, 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 Project Completion and for final inspection for acceptance.
    - c. Submittal of written warranties.
    - d. Requirements for completing sustainable design documentation.
    - e. Requirements for preparing operations and maintenance data.
    - f. Requirements for delivery of material samples, attic stock, and spare parts.
    - g. Requirements for demonstration and training.
    - h. Preparation of Contractor's punch list.
    - i. Procedures for processing Applications for Payment at Project Completion and for final payment.
    - j. Submittal procedures.
    - k. Coordination of separate contracts.
    - l. Requirements for completing sustainable design documentation.
    - m. Owner's partial occupancy requirements.
    - n. Installation of Owner's furniture, fixtures, and equipment.
    - o. Responsibility for removing temporary facilities and controls.

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4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Construction Manager will conduct progress meetings at weekly intervals.
  1. Coordinate preparation of payment requests with dates of meetings.
  2. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. 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) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Resolution of BIM component conflicts.
      - 4) Status of submittals.
      - 5) Status of sustainable design documentation.
      - 6) Deliveries.
      - 7) Off-site fabrication.
      - 8) Access.
      - 9) Site utilization.
      - 10) Temporary facilities and controls.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Status of correction of deficient items.
      - 14) Field observations.
      - 15) Status of RFIs.
      - 16) Status of proposal requests.
      - 17) Pending changes.
      - 18) Status of Change Orders.
      - 19) Pending claims and disputes.
      - 20) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

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- a. Schedule Updating: Contractor shall revise construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Contractor shall provide revised schedule to reporting entity so that it may be issued concurrently with the report of each meeting.
- F. Coordination Meetings: Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
  1. Construction Manager will conduct project coordination meetings at weekly intervals. Revise first subparagraph below if Project requires coordination meetings on a monthly or weekly basis.
  2. Attendees: In addition to representatives of Owner 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.
  3. 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) Resolution of BIM component conflicts.
      - 4) Status of submittals.
      - 5) Deliveries.
      - 6) Off-site fabrication.
      - 7) Access.
      - 8) Site utilization.
      - 9) Temporary facilities and controls.
      - 10) Work hours.
      - 11) Hazards and risks.
      - 12) Progress cleaning.
      - 13) Quality and work standards.
      - 14) Change Orders.
  4. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

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**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION 013100**



## REQUEST FOR INTERPRETATION



<b>Project Name:</b> Tokay HS Site - Increment 1		<b>LPA Inc. Job No.</b> 18180.10	
		<b>RFI No.</b>	
<b>To: LPA Inc.</b> 431 I Street, Suite 107 Sacramento CA 95814		<b>Contractor:</b>	
<b>Subject:</b>			
<b>Specified Section</b>	<b>Paragraph No.</b>	<b>Drawing No.</b>	<b>Detail No.</b>
<b>Category:</b> <input type="checkbox"/> Need for Clarification <input type="checkbox"/> Unforeseen Condition <input type="checkbox"/> Conflict Within Documents		<input type="checkbox"/> Coordination Problem <input type="checkbox"/> Other	
<b>Description:</b>			
<b>Contractor's Proposed Resolution:</b>			
<input type="checkbox"/> Attachments: <input type="checkbox"/> Cost Impact: \$ (Estimated) <input type="checkbox"/> Time Impact:			
<b>Contractor Signature</b>			<b>Date:</b>
<b>Architect's Response:</b>			
<input type="checkbox"/> Attachments:			
<b>Architect Signature:</b>			<b>Date:</b>

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## SECTION 013200 CONSTRUCTION PROGRESS DOCUMENTATION

### PART 1 - GENERAL

#### 1.01 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.
    - a. Upcoming Work Summaries (Short Interval Schedules).
  - 2. Construction schedule updating reports.
  - 3. Special reports.
- B. Related Requirements:
  - 1. Division 01 Section "DSA Quality Requirements" for submitting a schedule of tests and inspections.

#### 1.02 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 schedule.
  - 3. Successor Activity: An activity that follows another activity in the schedule.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Relational calculations determine when activities can be performed and the critical path of the Project.
- 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 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.
- G. Project Completion: Substantial Completion.
- H. Project Completion: Final Completion.

#### 1.03 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following formats, of size required to display entire schedule for entire construction period:
  - 1. Paper copies, in the number required by Division 01 Section "Submittal Procedures."
- B. Start-up construction schedule.

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- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- D. 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 all 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 all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
  - 3. Total Float Report: List of all activities sorted in ascending order of total float.
  - 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- E. Material Location Reports: Submit at monthly intervals.
- F. Field Condition Reports: Submit at time of discovery of differing conditions.
- G. Qualification Data: For scheduling consultant.

#### 1.04 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
  - 1. Discuss constraints, including work stages.

#### 1.05 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
  - 1. Secure time commitments for performing critical elements of the Work from entities involved.
  - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
- C. Contract Time generally refers to calendar days. Coordinate working days, nonworking days and holidays as required to correlate with Contract Time.

### PART 2 - PRODUCTS

#### 2.01 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.
- B. Activities: Treat each building, story or separate area as a separate numbered activity group for each principal element of the Work, as applicable. Comply with the following:
  - 1. Activity Duration: Define activities so no activity is longer than twenty days, unless specifically allowed by Architect.

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2. Procurement Activities: Include procurement process activities for the following long lead items and other 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.
  3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
  4. Startup and Testing Time: Include not less than fourteen days for startup and testing.
  5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
  6. Punch List and Final Completion: Include not more than thirty days for punch list and final completion.
- C. 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. Uninterruptible services.
    - c. Use of premises restrictions.
    - d. Environmental control.
- D. Upcoming Work Summaries (Short Interval Schedules): Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update, but not less than two week's activity. Submit an updated upcoming work schedule at each job progress meeting. Summarize the following issues:
1. Unresolved issues.

## 2.02 START-UP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit start-up horizontal bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

## 2.03 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
  1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

## 2.04 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. Start-up Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- B. CPM Schedule Requirements: Prepare Contractor's construction schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

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1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
- C. CPM Schedule Requirements: Prepare a list of all activities required to complete the Work. Using the start-up 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. Delivery.
    - b. Fabrication.
    - c. Testing and commissioning.
  2. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under principal subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
- D. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
  1. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
    - a. Submit value summary printouts one week before each regularly scheduled progress meeting.

## 2.05 REPORTS

- A. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

## 2.06 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

## PART 3 - EXECUTION

### 3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. 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.
- B. 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.
- C. As the Work progresses, indicate final completion percentage for each activity.
- D. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

## END OF SECTION 013200.00

013200 - 4	CONSTRUCTION PROGRESS DOCUMENTATION
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## DOCUMENT 01 32 13

**SCHEDULING OF WORK****PART 1 – GENERAL****1.01 RELATED DOCUMENTS AND PROVISIONS**

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions;
- C. Summary of Work; and
- D. Submittals.

**1.02 SECTION INCLUDES**

- A. Scheduling of Work under this Contract shall be performed by Contractor in accordance with requirements of this Section.
  - (1) Development of schedule, cost and resource loading of the schedule, monthly payment requests, and project status reporting requirements of the Contract shall employ computerized Critical Path Method ("CPM") scheduling ("CPM Schedule").
  - (2) CPM Schedule shall be cost loaded based on Schedule of Values as approved by District.
  - (3) Submit schedules and reports as specified in the General Conditions.
- B. Upon Award of Contract, Contractor shall immediately commence development of Initial and Original CPM Schedules to ensure compliance with CPM Schedule submittal requirements.

**1.03 CONSTRUCTION SCHEDULE**

- A. Within ten (10) days of being awarded the Contract and before request for first progress payment, the Contractor shall prepare and submit to the Project Manager a construction progress schedule conforming to the Milestone Schedule below.
- B. The Construction Schedule shall be continuously updated, and an updated schedule shall be submitted with each application for progress payment. Each revised schedule shall indicate the work actually accomplished during the previous period and the schedule for completion of the remaining work.

- C. Milestone Schedule – refer to Document 00 01 20 List of Schedules.

#### **1.04 QUALIFICATIONS**

- A. Contractor shall employ experienced scheduling personnel qualified to use the latest version of [i.e., Primavera Project Planner]. Experience level required is set forth below. Contractor may employ such personnel directly or may employ a consultant for this purpose.
- (1) The written statement shall identify the individual who will perform CPM scheduling.
  - (2) Capability and experience shall be verified by description of construction projects on which individual has successfully applied computerized CPM.
  - (3) Required level of experience shall include at least two (2) projects of similar nature and scope with value not less than three fourths ( $\frac{3}{4}$ ) of the Total Bid Price of this Project. The written statement shall provide contact persons for referenced projects with current telephone and address information.
- B. District reserves the right to approve or reject Contractor's scheduler or consultant at any time. District reserves the right to refuse replacing of Contractor's scheduler or consultant, if District believes replacement will negatively affect the scheduling of Work under this Contract.

#### **1.05 GENERAL**

- A. Progress Schedule shall be based on and incorporate milestone and completion dates specified in Contract Documents.
- B. Overall time of completion and time of completion for each milestone shown on Progress Schedule shall adhere to times in the Contract, unless an earlier (advanced) time of completion is requested by Contractor and agreed to by District. Any such agreement shall be formalized by a Change Order.
- (1) District is not required to accept an early completion schedule, i.e., one that shows an earlier completion date than the Contract Time.
  - (2) Contractor shall not be entitled to extra compensation in event agreement is reached on an earlier completion schedule and Contractor completes its Work, for whatever reason, beyond completion date shown in its early completion schedule but within the Contract Time.
  - (3) A schedule showing the work completed in less than the Contract Time, and that has been accepted by District, shall be considered to have Project Float. The Project Float is the time between the scheduled completion of the work and the Completion Date. Project Float is a resource available to both District and the Contractor.

- C. Ownership Project Float: Neither the District nor Contractor owns Project Float. The Project owns the Project Float. As such, liability for delay of the Completion Date rests with the party whose actions, last in time, actually cause delay to the Completion Date.
  - (1) For example, if Party A uses some, but not all of the Project Float and Party B later uses remainder of the Project Float as well as additional time beyond the Project Float, Party B shall be liable for the time that represents a delay to the Completion Date.
  - (2) Party A would not be responsible for the time since it did not consume the entire Project Float and additional Project Float remained; therefore, the Completion Date was unaffected by Party A.
- D. Progress Schedule shall be the basis for evaluating job progress, payment requests, and time extension requests. Responsibility for developing Contract CPM Schedule and monitoring actual progress as compared to Progress Schedule rests with Contractor.
- E. Failure of Progress Schedule to include any element of the Work, or any inaccuracy in Progress Schedule, will not relieve Contractor from responsibility for accomplishing the Work in accordance with the Contract. District's acceptance of schedule shall be for its use in monitoring and evaluating job progress, payment requests, and time extension requests and shall not, in any manner, impose a duty of care upon District, or act to relieve Contractor of its responsibility for means and methods of construction.
- F. Software: Use Microsoft Project. Such software shall be compatible with Windows operating system. Contractor shall transmit contract file to District on compact disk at times requested by District.
- G. Transmit each item under the form approved by District.
  - (1) Identify Project with District Contract number and name of Contractor.
  - (2) Provide space for Contractor's approval stamp and District's review stamps.
  - (3) Submittals received from sources other than Contractor will be returned to the Contractor without District's review.

#### **1.06 INITIAL CPM SCHEDULE**

- A. Initial CPM Schedule submitted for review at the pre-construction conference shall serve as Contractor's schedule for up to ninety (90) calendar days after the Notice to Proceed.
- B. Indicate detailed plan for the Work to be completed in first ninety (90) days of the Contract; details of planned mobilization of plant and equipment; sequence of early operations; procurement of materials and equipment. Show Work beyond ninety (90) calendar days in summary form.
- C. Initial CPM Schedule shall be time scaled.



- D. Initial CPM Schedule shall be cost and resource loaded. Accepted cost and resource loaded schedule will be used as basis for monthly progress payments until acceptance of the Original CPM Schedule. Use of Initial CPM Schedule for progress payments shall not exceed ninety (90) calendar days.
- E. District and Contractor shall meet to review and discuss the Initial CPM Schedule within seven (7) calendar days after it has been submitted to District.
  - (1) District's review and comment on the schedule shall be limited to Contract conformance (with sequencing, coordination, and milestone requirements).
  - (2) Contractor shall make corrections to schedule necessary to comply with Contract requirements and shall adjust schedule to incorporate any missing information requested by District. Contractor shall resubmit Initial CPM Schedule if requested by District.
- F. If, during the first ninety (90) days after Notice to Proceed, the Contractor is of the opinion that any of the Work included on its Initial CPM Schedule has been impacted, the Contractor shall submit to District a written Time Impact Evaluation ("TIE") in accordance with Article 1.12 of this Section. The TIE shall be based on the most current update of the Initial CPM Schedule.

#### **1.07 ORIGINAL CPM SCHEDULE**

- A. Submit a detailed proposed Original CPM Schedule presenting an orderly and realistic plan for completion of the Work in conformance with requirements as specified herein.
- B. Progress Schedule shall include or comply with following requirements:
  - (1) Time scaled, cost and resource (labor and major equipment) loaded CPM schedule.
  - (2) No activity on schedule shall have duration longer than fifteen (15) work days, with exception of submittal, approval, fabrication and procurement activities, unless otherwise approved by District.
    - (a) Activity durations shall be total number of actual work days required to perform that activity.
  - (3) The start and completion dates of all items of Work, their major components, and milestone completion dates, if any.
  - (4) District furnished materials and equipment, if any, identified as separate activities.
  - (5) Activities for maintaining Project Record Documents.
  - (6) Dependencies (or relationships) between activities.

- (7) Processing/approval of submittals and shop drawings for all material and equipment required per the Contract. Activities that are dependent on submittal acceptance or material delivery shall not be scheduled to start earlier than expected acceptance or delivery dates.
  - (a) Include time for submittals, re-submittals and reviews by District. Coordinate with accepted schedule for submission of Shop Drawings, samples, and other submittals.
  - (b) Contractor shall be responsible for all impacts resulting from re-submittal of Shop Drawings and submittals.
- (8) Procurement of major equipment, through receipt and inspection at jobsite, identified as separate activity.
  - (a) Include time for fabrication and delivery of manufactured products for the Work.
  - (b) Show dependencies between procurement and construction.
- (9) Activity description; what Work is to be accomplished and where.
- (10) The total cost of performing each activity shall be total of labor, material, and equipment, excluding overhead and profit of Contractor. Overhead and profit of the General Contractor shall be shown as a separate activity in the schedule. Sum of cost for all activities shall equal total Contract value.
- (11) Resources required (labor and major equipment) to perform each activity.
- (12) Responsibility code for each activity corresponding to Contractor or Subcontractor responsible for performing the Work.
- (13) Identify the activities which constitute the controlling operations or critical path. No more than twenty-five (25%) of the activities shall be critical or near critical. Near critical is defined as float in the range of one (1) to (10) days.
- (14) Twenty (20) workdays for developing punch list(s), completion of punch-list items, and final clean up for the Work or any designated portion thereof. No other activities shall be scheduled during this period.
- (15) Interface with the work of other contractors, District, and agencies such as, but not limited to, utility companies.
- (16) Show detailed Subcontractor Work activities. In addition, furnish copies of Subcontractor schedules upon which CPM was built.
  - (a) Also furnish for each Subcontractor, as determined by District, submitted on Subcontractor letterhead, a statement certifying that Subcontractor concurs with Contractor's Original CPM

Schedule and that Subcontractor's related schedules have been incorporated, including activity duration, cost and resource loading.

- (b) Subcontractor schedules shall be independently derived and not a copy of Contractor's schedule.
  - (c) In addition to Contractor's schedule and resource loading, obtain from electrical, mechanical, and plumbing Subcontractors, and other Subcontractors as required by District, productivity calculations common to their trades, such as units per person day, feet of pipe per day per person, feet of wiring per day per person, and similar information.
  - (d) Furnish schedule for Contractor/Subcontractor CPM schedule meetings which shall be held prior to submission of Original CPM schedule to District. District shall be permitted to attend scheduled meetings as an observer.
- (17) Activity durations shall be in Work days.
- (18) Submit with the schedule a list of anticipated non-Work days, such as weekends and holidays. The Progress Schedule shall exclude in its Work day calendar all non-Work days on which Contractor anticipates critical Work will not be performed.
- C. Original CPM Schedule Review Meeting: Contractor shall, within sixty (60) days from the Notice to Proceed date, meet with District to review the Original CPM Schedule submittal.
  - (1) Contractor shall have its Project Manager, Project Superintendent, Project Scheduler, and key Subcontractor representatives, as required by District, in attendance. The meeting will take place over a continuous one (1) day period.
  - (2) District's review will be limited to submittal's conformance to Contract requirements including, but not limited to, coordination requirements. However, review may also include:
    - (a) Clarifications of Contract Requirements.
    - (b) Directions to include activities and information missing from submittal.
    - (c) Requests to Contractor to clarify its schedule.
  - (3) Within five (5) days of the Schedule Review Meeting, Contractor shall respond in writing to all questions and comments expressed by District at the Meeting.

**1.08 ADJUSTMENTS TO CPM SCHEDULE**

- A. Adjustments to Original CPM Schedule: Contractor shall have adjusted the Original CPM Schedule submittal to address all review comments from original CPM Schedule review meeting and resubmit network diagrams and reports for District's review.
- (1) District, within ten (10) days from date that Contractor submitted the revised schedule, will either:
    - (a) Accept schedule and cost and resource loaded activities as submitted, or
    - (b) Advise Contractor in writing to review any part or parts of schedule which either do not meet Contract requirements or are unsatisfactory for District to monitor Project's progress, resources, and status or evaluate monthly payment request by Contractor.
  - (2) District may accept schedule with conditions that the first monthly CPM Schedule update be revised to correct deficiencies identified.
  - (3) When schedule is accepted, it shall be considered the "Original CPM Schedule" which will then be immediately updated to reflect the current status of the work.
  - (4) District reserves right to require Contractor to adjust, add to, or clarify any portion of schedule which may later be discovered to be insufficient for monitoring of Work or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions, or clarifications.
- B. Acceptance of Contractor's schedule by District will be based solely upon schedule's compliance with Contract requirements.
- (1) By way of Contractor assigning activity durations and proposing sequence of Work, Contractor agrees to utilize sufficient and necessary management and other resources to perform work in accordance with the schedule.
  - (2) Upon submittal of schedule update, updated schedule shall be considered "current" CPM Schedule.
  - (3) Submission of Contractor's schedule to District shall not relieve Contractor of total responsibility for scheduling, sequencing, and pursuing Work to comply with requirements of Contract Documents, including adverse effects such as delays resulting from ill-timed Work.
- C. Submittal of Original CPM Schedule, and subsequent schedule updates, shall be understood to be Contractor's representation that the Schedule meets requirements of Contract Documents and that Work shall be executed in sequence indicated on the schedule.

- D. Contractor shall distribute Original CPM Schedule to Subcontractors for review and written acceptance, which shall be noted on Subcontractors' letterheads to Contractor and transmitted to District for the record.

#### **1.09 MONTHLY CPM SCHEDULE UPDATE SUBMITTALS**

- A. Following acceptance of Contractor's Original CPM Schedule, Contractor shall monitor progress of Work and adjust schedule each month to reflect actual progress and any anticipated changes to planned activities.
  - (1) Each schedule update submitted shall be complete, including all information requested for the Original CPM Schedule submittal.
  - (2) Each update shall continue to show all Work activities including those already completed. These completed activities shall accurately reflect "as built" information by indicating when activities were actually started and completed.
- B. A meeting will be held on approximately the twenty-fifth (25th) of each month to review the schedule update submittal and progress payment application.
  - (1) At this meeting, at a minimum, the following items will be reviewed: Percent (%) complete of each activity; Time Impact Evaluations for Change Orders and Time Extension Request; actual and anticipated activity sequence changes; actual and anticipated duration changes; and actual and anticipated Contractor delays.
  - (2) These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate personnel attend. At a minimum, these meetings shall be attended by Contractor's General Superintendent and Scheduler.
  - (3) Contractor shall plan on the meeting taking no less than four (4) hours.
- C. Within five (5) working days after monthly schedule update meeting, Contractor shall submit the updated CPM Schedule update.
- D. Within five (5) work days of receipt of above noted revised submittals, District will either accept or reject monthly schedule update submittal.
  - (1) If accepted, percent (%) complete shown in monthly update will be basis for Application for Payment by the Contractor. The schedule update shall be submitted as part of the Contractor's Application for Payment.
  - (2) If rejected, update shall be corrected and resubmitted by Contractor before the Application for Payment is submitted.
- E. Neither updating, changing or revising of any report, curve, schedule, or narrative submitted to District by Contractor under this Contract, nor District's review or acceptance of any such report, curve, schedule or narrative shall

have the effect of amending or modifying in any way the Completion Date or milestone dates or of modifying or limiting in any way Contractor's obligations under this Contract.

#### **1.10 SCHEDULE REVISIONS**

- A. Updating the Schedule to reflect actual progress shall not be considered revisions to the Schedule. Since scheduling is a dynamic process, revisions to activity durations and sequences are expected on a monthly basis.
- B. To reflect revisions to the Schedule, the Contractor shall provide District with a written narrative with a full description and reasons for each Work activity revised. For revisions affecting the sequence of work, the Contractor shall provide a schedule diagram which compares the original sequence to the revised sequence of work. The Contractor shall provide the written narrative and schedule diagram for revisions two (2) working days in advance of the monthly schedule update meeting.
- C. Schedule revisions shall not be incorporated into any schedule update until the revisions have been reviewed by District. District may request further information and justification for schedule revisions and Contractor shall, within three (3) days, provide District with a complete written narrative response to District's request.
- D. If the Contractor's revision is still not accepted by District, and the Contractor disagrees with District's position, the Contractor has seven (7) calendar days from receipt of District's letter rejecting the revision to provide a written narrative providing full justification and explanation for the revision. The Contractor's failure to respond in writing within seven (7) calendar days of District's written rejection of a schedule revision shall be contractually interpreted as acceptance of District's position, and the Contractor waives its rights to subsequently dispute or file a claim regarding District's position.
- E. At District's discretion, the Contractor can be required to provide Subcontractor certifications of performance regarding proposed schedule revisions affecting said Subcontractors.

#### **1.11 RECOVERY SCHEDULE**

- A. If the Schedule Update shows a completion date twenty-one (21) calendar days beyond the Contract Completion Date, or individual milestone completion dates, the Contractor shall submit to District the proposed revisions to recover the lost time within seven (7) calendar days. As part of this submittal, the Contractor shall provide a written narrative for each revision made to recapture the lost time. If the revisions include sequence changes, the Contractor shall provide a schedule diagram comparing the original sequence to the revised sequence of work.
- B. The revisions shall not be incorporated into any schedule update until the revisions have been reviewed by District.

- C. If the Contractor's revisions are not accepted by District, District and the Contractor shall follow the procedures in paragraph 1.09.C, 1.09.D and 1.09.E above.
- D. At District's discretion, the Contractor can be required to provide Subcontractor certifications for revisions affecting said Subcontractors.

#### **1.12 TIME IMPACT EVALUATION ("TIE") FOR CHANGE ORDERS, AND OTHER DELAYS**

- A. When Contractor is directed to proceed with changed Work, the Contractor shall prepare and submit within fourteen (14) calendar days from the Notice to Proceed a TIE which includes both a written narrative and a schedule diagram depicting how the changed Work affects other schedule activities. The schedule diagram shall show how the Contractor proposes to incorporate the changed Work in the schedule and how it impacts the current schedule-update critical path. The Contractor is also responsible for requesting time extensions based on the TIE's impact on the critical path. The diagram must be tied to the main sequence of schedule activities to enable District to evaluate the impact of changed Work to the scheduled critical path.
- B. Contractor shall be required to comply with the requirements of Paragraph 1.09.A for all types of delays such as, but not limited to, Contractor/Subcontractor delays, adverse weather delays, strikes, procurement delays, fabrication delays, etc.
- C. Contractor shall be responsible for all costs associated with the preparation of TIEs, and the process of incorporating them into the current schedule update. The Contractor shall provide District with four (4) copies of each TIE.
- D. Once agreement has been reached on a TIE, the Contract Time will be adjusted accordingly. If agreement is not reached on a TIE, the Contract Time may be extended in an amount District allows, and the Contractor may submit a claim for additional time claimed by contractor.

#### **1.13 TIME EXTENSIONS**

- A. The Contractor is responsible for requesting time extensions for time impacts that, in the opinion of the Contractor, impact the critical path of the current schedule update. Notice of time impacts shall be given in accord with the General Conditions.
- B. Where an event for which District is responsible impacts the projected Completion Date, the Contractor shall provide a written mitigation plan, including a schedule diagram, which explains how (e.g., increase crew size, overtime, etc.) the impact can be mitigated. The Contractor shall also include a detailed cost breakdown of the labor, equipment, and material the Contractor would expend to mitigate District-caused time impact. The Contractor shall submit its mitigation plan to District within fourteen (14) calendar days from the date of discovery of the impact. The Contractor is responsible for the cost to prepare the mitigation plan.



- C. Failure to request time, provide TIE, or provide the required mitigation plan will result in Contractor waiving its right to a time extension and cost to mitigate the delay.
- D. No time will be granted under this Contract for cumulative effect of changes.
- E. District will not be obligated to consider any time extension request unless the Contractor complies with the requirements of Contract Documents.
- F. Failure of the Contractor to perform in accordance with the current schedule update shall not be excused by submittal of time extension requests.
- G. If the Contractor does not submit a TIE within the required fourteen (14) calendar days for any issue, it is mutually agreed that the Contractor does not require a time extension for said issue.

#### **1.14 SCHEDULE REPORTS**

- A. Submit four (4) copies of the following reports with the Initial CPM Schedule, the Original CPM Schedule, and each monthly update.
- B. Required Reports:
  - (1) Two activity listing reports: one sorted by activity number and one by total Project Float. These reports shall also include each activity's early/late and actual start and finish dates, original and remaining duration, Project Float, responsibility code, and the logic relationship of activities.
  - (2) Cost report sorted by activity number including each activity's associated cost, percentage of Work accomplished, earned value- to date, previous payments, and amount earned for current update period.
  - (3) Schedule plots presenting time-scaled network diagram showing activities and their relationships with the controlling operations or critical path clearly highlighted.
  - (4) Cash flow report calculated by early start, late start, and indicating actual progress. Provide an exhibit depicting this information in graphic form.
  - (5) Planned versus actual resource (i.e., labor) histogram calculated by early start and late start.
- C. Other Reports:

In addition to above reports, District may request, from month to month, any two of the following reports. Submit four (4) copies of all reports.

- (1) Activities by early start.
- (2) Activities by late start.



- (3) Activities grouped by Subcontractors or selected trades.
- (4) Activities with scheduled early start dates in a given time frame, such as fifteen (15) or thirty (30) day outlook.
- D. Furnish District with report files on compact disks containing all schedule files for each report generated.

### **1.15 PROJECT STATUS REPORTING**

- A. In addition to submittal requirements for CPM scheduling identified in this Section, Contractor shall provide a monthly project status report (i.e., written narrative report) to be submitted in conjunction with each CPM Schedule as specified herein. Status reporting shall be in form specified below.
- B. Contractor shall prepare monthly written narrative reports of status of Project for submission to District. Written status reports shall include:
  - (1) Status of major Project components (percent (%) complete, amount of time ahead or behind schedule) and an explanation of how Project will be brought back on schedule if delays have occurred.
  - (2) Progress made on critical activities indicated on CPM Schedule.
  - (3) Explanations for any lack of work on critical path activities planned to be performed during last month.
  - (4) Explanations for any schedule changes, including changes to logic or to activity durations.
  - (5) List of critical activities scheduled to be performed next month.
  - (6) Status of major material and equipment procurement.
  - (7) Any delays encountered during reporting period.
  - (8) Contractor shall provide printed report indicating actual versus planned resource loading for each trade and each activity. This report shall be provided on weekly and monthly basis.
    - (a) Actual resource shall be accumulated in field by Contractor, and shall be as noted on Contractor's daily reports. These reports will be basis for information provided in computer-generated monthly and weekly printed reports.
    - (b) Contractor shall explain all variances and mitigation measures.
  - (9) Contractor may include any other information pertinent to status of Project. Contractor shall include additional status information requested by District at no additional cost.

- (10) Status reports, and the information contained therein, shall not be construed as claims, notice of claims, notice of delay, or requests for changes or compensation.

#### **1.16 WEEKLY SCHEDULE REPORT**

At the Weekly Progress Meeting, the Contractor shall provide and present a time-scaled three (3) week look-ahead schedule that is based and correlated by activity number to the current schedule (i.e., Initial, Original CPM, or Schedule Update).

#### **1.17 DAILY CONSTRUCTION REPORTS**

On a daily basis, Contractor shall submit a daily activity report to District for each workday, including weekends and holidays when worked. Contractor shall develop the daily construction reports on a computer-generated database capable of sorting daily Work, manpower, and man-hours by Contractor, Subcontractor, area, sub-area, and Change Order Work. Upon request of District, furnish computer disk of this data base. Obtain District's written approval of daily construction report data base format prior to implementation. Include in report:

- A. Project name and Project number.
- B. Contractor's name and address.
- C. Weather, temperature, and any unusual site conditions.
- D. Brief description and location of the day's scheduled activities and any special problems and accidents, including Work of Subcontractors. Descriptions shall be referenced to CPM scheduled activities.
- E. Worker quantities for its own Work force and for Subcontractors of any tier.
- F. Equipment, other than hand tools, utilized by Contractor and Subcontractors.

#### **1.18 PERIODIC VERIFIED REPORTS**

Contractor shall complete and verify construction reports on a form prescribed by the Division of the State Architect and file reports on the first day of February, May, August, and November during the preceding quarter year; at the completion of the Contract; at the completion of the Work; at the suspension of Work for a period of more than one (1) month; whenever the services of Contractor or any of Contractor's Subcontractors are terminated for any reason; and at any time a special verified report is required by the Division of the State Architect. Refer to section 4-336 and section 4-343 of Part 1, Title 24 of the California Code of Regulations.

#### **PART 2 – PRODUCTS Not Used.**

#### **PART 3 - EXECUTION Not Used.**

END OF DOCUMENT

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## **SECTION 013300 SUBMITTAL PROCEDURES**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Administrative and procedural requirements for submittals required for the Work, including but not limited to; Shop Drawings, Product Data, Samples, material lists, and quality control items as required by the Contract Documents.
- B. Wherever possible, throughout the Contract Documents, the minimum acceptable quality of workmanship and products has been defined by the name and catalog number of a manufacturer and by reference of recognized industry standards.
- C. To ensure that specified products are furnished and installed in accordance with the design intent, and procedures have been established for submittal of design data and for its review by District REPRESENTATIVE, ARCHITECT, and/or others.

#### **1.02 RELATED SECTIONS**

- A. Div 00 - General Conditions.
- B. Section 01 3100.00: Project Management and Coordination.
- C. Section 01 4010.00: DSA Quality Requirements
- D. Section 01 5000.00: Temporary Facilities and Controls.
- E. Section 01 6000: Product Requirements
- F. Division 2 through Division 33.

### **PART 2 - PRODUCTS (NOT APPLICABLE)**

### **PART 3 - EXECUTION**

#### **3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE**

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
- B. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, and any other document any participant wishes to make part of the project record.
- C. Contractor and Architect are required to use this service.
- D. It is Contractor's responsibility to submit documents in PDF format.
- E. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no extra charge.
- F. Users of the service need an email address, Internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, [www.adobe.com](http://www.adobe.com), or Bluebeam PDF Revu, [www.bluebeam.com](http://www.bluebeam.com)), unless such software capability is provided by the service provider.
- G. Paper document transmittals will not be reviewed (except DSA Deferred Approvals and close out M&O Manuals); emailed PDF documents will not be reviewed.
- H. All other specified submittal and document transmission procedures apply, except that electronic document requirements to not apply to samples or color selection charts.

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- I. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.
- J. Project Closeout: Architect will determine when to terminate the service for the project.

### 3.02 GENERAL REQUIREMENT AND PROCEDURES

- A. CONTRACTOR shall package each submittal appropriately for transmittal and handling and will then send ARCHITECT, and DISTRICT REPRESENTATIVE submittal for review per the Project plans and specifications. Submittals will not be accepted from sources other than from CONTRACTOR.
- B. CONTRACTOR shall clearly identify any deviations from the Contract Documents on each submittal. Any deviation not so noted, even if stamped reviewed, is not acceptable.
- C. After ARCHITECT review, ARCHITECT shall transmit submittals to CONTRACTOR, DISTRICT REPRESENTATIVE, and PI. CONTRACTOR shall further distribute to SUBCONTRACTORS and others as required. Work shall not commence, unless otherwise approved by DISTRICT REPRESENTATIVE, and/or ARCHITECT until approved submittals are transmitted to CONTRACTOR.
- D. CONTRACTOR'S Review and Approval: **Every submittal upon which proper execution of the Work is dependent shall bear the CONTRACTORS review and approval stamp, dated and signed by CONTRACTOR.** Certifying that CONTRACTOR (a) has reviewed, checked, and approved the submittal and has coordinated the submittal contents with requirements of Work and Contract Documents including related Work, (b) CONTRACTOR coordinated with all other shop drawings received to date and this duty of coordination has not been delegated to subcontractors, material suppliers, the Architect, or the engineers on this project, (c) determined and verified quantities, field measurements, construction criteria, materials, equipment, catalog numbers and identifications, and similar data, or will do so, and (d) states the Work illustrated or described in the submittal is recommended by CONTRACTOR and the CONTRACTORS warranty will fully apply thereto.
- E. CONTRACTOR shall coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities requiring sequential activity.
- F. Timing of Submittals:
  - 1. In accordance with General Conditions, CONTRACTOR shall submit to the ARCHITECT, those Shop Drawings, Product Data, diagrams, materials lists, Samples and other submittals required by the Contract Documents.
  - 2. The CONTRACTOR shall submit within ten (10) calendar days of the Notice to Proceed, an itemized listing of required submittals with a scheduled date for each submittal. The schedule of submittals shall provide adequate time between submittals in order to allow for proper review without negative impact to the Construction Schedule.
  - 3. Schedule of submittals shall be related to Work progress, and shall be so organized as to allow sufficient time for transmitting, reviewing, corrections, resubmission, and re-reviewing.
  - 4. CONTRACTOR shall coordinate submittal of related items and ARCHITECT reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received by ARCHITECT.
  - 5. CONTRACTOR shall revise, update and submit submittal schedule to DISTRICT REPRESENTATIVE and ARCHITECT on the first of each month, or as required by the DISTRICT REPRESENTATIVE.

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6. CONTRACTOR shall allow in the Construction Schedule, at least fourteen (14) calendar days for ARCHITECT review following ARCHITECT receipt of submittal. For mechanical, plumbing, electrical, structural, and other submittals requiring joint review with ARCHITECT'S Consultants, and/or others, CONTRACTOR shall allow a minimum of eighteen (18) calendar days following ARCHITECT receipt of submittal. Submittals will be reviewed with reasonable promptness, but ARCHITECT reserves the right of additional time where required based on but limited to submittal size, complexity, etc.
  7. No adjustments to the Contract Time and/or Milestones will be authorized because of a failure to transmit submittals to ARCHITECT sufficiently in advance of the Work to permit review and processing.
  8. In case of product substitution, Shop Drawing preparation shall not commence until such time ARCHITECT and DISTRICT REPRESENTATIVE reviews said submittal relative to the General Conditions.
- G. Resubmit submittals in a timely manner. Resubmit as specified for initial submittal but identify as such. Review times for re-submitted items shall be as per the time frames for initial submittal review.
- H. ARCHITECT, or authorized agent, will stamp each submittal with a uniform, action stamp marking the stamp appropriately to indicate the action taken, as follows:
1. Final Unrestricted Release: When ARCHITECT, or authorized agent, marks a submittal "Reviewed" the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
  2. Final-But-Restricted Release: When ARCHITECT, or authorized agent, marks a submittal "Make Corrections Noted" (Reviewed as Noted) the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
  3. Returned for Re-submittal: When ARCHITECT, or authorized agent, marks a submittal "Revise and Resubmit, Submit Specified Item, Rejected" do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat as necessary to obtain different action mark. In case of multiple submittals covering same items of Work, CONTRACTOR is responsible for any time delays, schedule disruptions, out of sequence Work, or additional costs due to multiple submissions of the same submittal item. Do not use, or allow others to use, submittals marked "Rejected, Revise and Resubmit" at the Project site or elsewhere where Work is in progress.
  4. Other Action: Where a submittal is for information or record purposes or special processing or other activity, the ARCHITECT, or authorized agent, will return the submittal marked "Action Not Required".
  5. Not Required Submittal: Where a submittal is submitted for review but is not required to be submitted, the ARCHITECT, or authorized agent, will return the submittal identified with "No Action Taken".
- I. Review and Approval of Submittals by the ARCHITECT: Submittals will be reviewed but only for conformance with the design concept of the Project and with the information indicated on the Drawings and stated in the Specifications. Approval of a separate item as such will not indicate approval of the assembly in which the item functions. Approval of submittals shall not relieve the CONTRACTOR of responsibility for any deviations from requirements of the Contract Documents or any revisions in resubmittals unless

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CONTRACTOR has given written notice of such deviation or revision at the time of submission or resubmission and written approval has been given to the specific deviation or revision, nor shall approval relieve the CONTRACTOR of responsibility for error or omissions in the submittals or for the accuracy of dimensions and quantities, the adequacy of connections, and the proper and acceptable fitting, execution, functioning, and completion to the Work.

- J. All costs for the preparation, correction, delivery, and return of the submittals shall be borne by the CONTRACTOR.

### 3.03 SHOP DRAWINGS

- A. Shop Drawings are original drawings in electronic format (except DSA deferred Approvals to be hard copies) prepared by CONTRACTOR, Subcontractor, supplier, or distributor illustrating some portion of Work by showing fabrication, layout, setting, or erection details. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Copies of the Contract Drawing marked to show Shop Drawing information are not acceptable and will be not be reviewed and will be promptly returned to the CONTRACTOR.
- B. Produce DSA Deferred Approval Shop Drawings to an accurate scale that is large enough to indicate all pertinent features and methods. Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 24 x 36 inches.
- C. Shop Drawings shall include, at a minimum, fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:
  - 1. Dimensions
  - 2. Identification of products and materials included by sheet and detail number.
  - 3. Compliance with specified standards.
  - 4. Notation of coordination requirements.
  - 5. Notation of dimensions established by field measurement.
- D. Provide two (2) spaces, approximately 4 by 5 inches, on the label or beside the title block on Shop Drawings to record CONTRACTOR and ARCHITECT review, and the action taken. Include the following information on the label for processing and recording action taken:
  - 1. Project name.
  - 2. Project number.
  - 3. Date.
  - 4. Name and address of ARCHITECT.
  - 5. Name and address of CONTRACTOR.
  - 6. Name and address of Subcontractor.
  - 7. Name and address of supplier.
  - 8. Name and address of manufacturer.
  - 9. Name and title of appropriate Specification section.
  - 10. Drawing number and detail references, as appropriate.

### 3.04 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of Work or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, wiring diagrams,

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schedules, illustrations, or performance curves.

1. Mark each copy to show or delineate pertinent materials, products, models, applicable choices, or options. Where Product Data includes information on several products that are not required, clearly mark copies to indicate the applicable information. Include the following information:
  - a. Manufacturer's printed recommendations.
  - b. Compliance with trade association standards.
  - c. Compliance with recognized testing agency standards.
  - d. Application of testing agency labels and seals.
  - e. Notation of dimensions verified by field measurement.
  - f. Notation of coordination requirements.
  - g. Notation of dimensions and required clearances.
  - h. Indicate performance characteristics and capacities.
  - i. Indicate wiring diagrams and controls.
2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

### 3.05 SAMPLES

- A. Submit Samples of sufficient size, quantity, cured and finished and physically identical to the proposed product or material. Samples include partial or full sections or range of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches denoting color, texture, and/or pattern.
  1. Mount or display Samples in the manner to facilitate review of qualities indicated. Include the following:
    - a. Specification section number and reference.
    - b. Generic description of the Sample.
    - c. Sampling source.
    - d. Product name or name of manufacturer.
    - e. Compliance with recognized standards.
    - f. Availability and delivery time.
  2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
    - a. Where variations in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show the approximate limits of the variations.
    - b. Refer to other Specification sections for requirements for Samples that illustrate workmanship, fabrication techniques, assembly details, connections, operation, and similar construction characteristics.
    - c. Refer to other sections for Samples to be returned to CONTRACTOR for incorporation into the Work. Such Samples must be undamaged at time of installation. On the transmittal indicate special requests regarding disposition of Sample submittals.

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- d. Samples not incorporated into the Work, or otherwise not designated as OWNER property, remain the property of CONTRACTOR and shall be removed from the Project site prior to Beneficial Occupancy.
- 3. Color and Pattern: Whenever a choice of color or pattern is available in a specified product, submit accurate color chips and pattern charts to ARCHITECT for review and selection by ARCHITECT and OWNER.
- 4. Required Copies and Distribution: Same as denoted in Section 3.02, E.
- B. When specified, erect field Samples and mock-ups at the Project site to illustrate products, materials, or workmanship and to establish standards by which completed Work shall be judged.
- C. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of the Work. Sample sets may be used to obtain final acceptance of the Work associated with each set.

### **3.06 QUALITY CONTROL SUBMITTALS**

- A. Submit quality control submittals, including design data, certifications, manufacturer's field reports, and other quality control submittals as required under other sections of the Contract Documents.
- B. When other sections of the Contract Documents require manufacturer's certification of a product, material, and/or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
- C. Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the represented company.
- D. Requirements for submittal of inspection and test reports are specified in other sections of the Contract Documents.

### **3.07 CERTIFICATES**

- A. Submit all certificates in triplicate to PI, in accordance with requirements of each Specification Section.

### **END OF SECTION 013300**



## ELECTRONIC DOCUMENT REQUEST FORM

From (Company):

Address:

Contact:

Phone:

Project Name:

Location:

DSA App. No.:

LPA Project No.:

Execution of this document will confirm your request for copies of documentation related to the above referenced project. Please return one fully executed copy of this form via mail to LPA, Inc., **431 I Street, Suite 107, Sacramento, CA 95814**; or via Email.

### Description of Documentation Requested:

Type of Files Needed: ☐ DWG (AutoCAD) ☐ Other \_\_\_\_\_ (subject to review and approval)

### Purpose of Request:

**If Requestor is a subcontractor to the project's General Contractor,** A written statement by the Project's General Contractor authorizing LPA to release documentation to a subcontractor of the General Contractor must be written below:

**If Requestor is a consultant to the Project's Owner,** please indicate below the name and phone number of the contact at Owner's Office:

**Disclaimer:** LPA can only release electronic files to the Project's Owner, consultants to the Project's Owner and/or the Projects' General Contractor. Please be advised that, in the case of existing construction, the documents requested are reproductions of documentation on file and do not necessarily represent as-built or existing conditions. LPA does not warrant, in any way, the accuracy of this information and shall not be responsible for any discrepancy between this documentation and the existing conditions.

In the case of projects which are currently being designed and/or under construction, the electronic documentation are reproductions of the documentation on file and may be subject to change due to Owner, field and/or coordination revisions. LPA shall not be responsible for reissuing files beyond the Bid Document files which may be revised after issuance of these requested files and shall not be responsible for advising other parties as to the status of document revisions. Also, please be advised that the requested documents are instruments of service and, as such, remain the property of LPA and/or the respective consultant. Any unauthorized re-use of these documents without the written authorization of LPA and/or consultant is strictly prohibited.

Please note all disclaimers and warnings printed on electronic media labels. Electronic media may contain undetected viruses. It is always recommended that disks be checked prior to use. LPA assumes no liability or responsibility for damage to user's property as a result of using this electronic media or its contents.

**Fees:** The charge for copying the requested files in DWG (AutoCAD) is **\$100.00** per sheet. The cost per sheet / files on a different software platform will be determined based on what is requested. Details are not released.

Other costs to be charged for the requested files may include archive storage and retrieval charges, reproduction and handling expenses, etc. The exact costs for these miscellaneous expenses will be determined by LPA upon execution of this request.

**Payment of these costs must be made by the Requestor prior to shipping of the requested documents.**

By signing this Request, the Requestor agrees to the disclaimer and reimbursement fees to LPA, Inc. as stated above:

Authorized Name and Signature:

Date:

## SUBMITTAL COVER SHEET



<b>Project Name:</b> Tokay HS Site - Increment 1  <b>LPA Inc. Job No.</b> 18180.10	<b>Resubmittal</b>	<b>Submittal No.</b>						
	<input type="checkbox"/> YES  Add "letter" to original number							
<b>SUBCONTRACTOR:</b>  <b>Name:</b>  <b>Address:</b>  <b>Telephone:</b>  <b>Contact:</b>	<b>CONTRACTOR:</b>  <b>Name:</b>  <b>Signed:</b>  <b>Dated:</b>  I hereby certify that I have reviewed the attached, have verified field requirements and compliance with the Contract Documents.							
<b>Submittal Description:</b>		<b>Specification Section:</b>						
<b>Date Received from Contractor:</b>	<b>Distribution Date:</b>							
<b>Consultant Review:</b>  <input type="checkbox"/> Civil <input type="checkbox"/> Electrical <input type="checkbox"/> Mechanical <input type="checkbox"/> Structural <input type="checkbox"/> Other:  <b>Date sent to consultant:</b>  <b>Date received from consultant:</b>	<b>Copies:</b>  <input type="checkbox"/> Contractor  <input type="checkbox"/> Inspector  <input type="checkbox"/> LPA File  <input type="checkbox"/> Owner  <input type="checkbox"/> Other: _____							
Review and commentary noted below are only for general conformance with (1) the design concept of the project and (2) the information given in the contract documents and for no other purpose. Commentary below is subject to the requirements of the contract documents. The Contractor is not relieved from responsibility for any deviation from the requirements of the contract documents, errors or omissions in drawings, calculations or samples, confirmation and correlation of dimensions at the job site, fabrication process and techniques of construction, coordination of his work with that of all other trades and satisfactory performance of his work.								
<table border="0"> <tr> <td><input type="checkbox"/> REVIEWED</td> <td><input type="checkbox"/> SUBMIT SPECIFIED ITEM</td> </tr> <tr> <td><input type="checkbox"/> FURNISH AS CORRECTED</td> <td><input type="checkbox"/> REJECTED</td> </tr> <tr> <td><input type="checkbox"/> REVISE &amp; RESUBMIT</td> <td></td> </tr> </table>			<input type="checkbox"/> REVIEWED	<input type="checkbox"/> SUBMIT SPECIFIED ITEM	<input type="checkbox"/> FURNISH AS CORRECTED	<input type="checkbox"/> REJECTED	<input type="checkbox"/> REVISE & RESUBMIT	
<input type="checkbox"/> REVIEWED	<input type="checkbox"/> SUBMIT SPECIFIED ITEM							
<input type="checkbox"/> FURNISH AS CORRECTED	<input type="checkbox"/> REJECTED							
<input type="checkbox"/> REVISE & RESUBMIT								
<b>Reviewed by:</b>	<b>Date:</b>							
<b>Remarks:</b>								

## DOCUMENT 01 35 13.23

**SITE STANDARDS****PART 1 – GENERAL****1.01 RELATED DOCUMENTS AND PROVISIONS:**

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including without limitation, Site Access, Conditions, and Regulations;
- B. Special Conditions;
- C. Drug-Free Workplace Certification;
- D. Tobacco-Free Environment Certification;
- E. Criminal Background Investigation/Fingerprinting Certification;
- F. Temporary Facilities and Controls.

**1.02 REQUIREMENTS OF THE DISTRICT:**

- A. Drug-Free Schools and Safety Requirements:
  - (1) All school sites and other District Facilities have been declared "Drug-Free Zones." No drugs, alcohol and/or smoking are allowed at any time in any buildings and/or grounds on District property. No students, staff, visitors, or contractors are to use drugs on these sites.
  - (2) Smoking and the use of tobacco products by all persons is prohibited on or in District property. District property includes school buildings, school grounds, school-owned vehicles and vehicles owned by others while on District property. Contractor shall post: "Non-Smoking Area" in a highly visible location in each work area, staging area, and parking area. Contractor may designate a smoking area outside of District property within the public right-of-way, provided that this area remains quiet and unobtrusive to adjacent neighbors. This smoking area is to be kept clean at all times.
  - (3) Contractor shall ensure that no alcohol, firearms, weapons, or controlled substances enter or are used at the Site. Contractor shall immediately remove from the Site and terminate the employment of any employee(s) found in violation of this provision.
- B. Language: Profanity or other unacceptable and/or loud language will not be tolerated, "Cat calls" or other derogatory language toward students, staff, volunteers, parents or public will not be allowed.

## C. Disturbing the Peace (Noise and Lighting):

- (1) Contractor shall observe the noise ordinance of the Site at all times including, without limitation, all applicable local, city, and/or state laws, ordinances, and/or regulations regarding noise and allowable noise levels.
- (2) The use of radios, etc., shall be controlled to keep all sound at a level that cannot be heard beyond the immediate area of use. District reserves the right to prohibit the use of radios at the Site, except for mobile phones or other handheld communication radios.
- (3) If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

## D. Traffic:

- (1) Driving on the Premises shall be limited to periods when students and public are not present. If driving or deliveries must be made during the school hours, two (2) or more ground guides shall lead the vehicle across the area of travel. In no case shall driving take place across playgrounds or other pedestrian paths during recess, lunch, and/or class period changes. The speed limit on-the Premises shall be five (5) miles per hour (maximum) or less if conditions require.
- (2) All paths of travel for deliveries, including without limitation, material, equipment, and supply deliveries, shall be reviewed and approved by District in advance. Any damage will be repaired to the pre-damaged condition by the Contractor.
- (3) District shall designate a construction entry to the Site. If Contractor requests, District determines it is required, and to the extent possible, District shall designate a staging area so as not to interfere with the normal functioning of school facilities. Location of gates and fencing shall be approved in advance with District and at Contractor's expense.
- (4) Parking areas shall be reviewed and approved by District in advance. No parking is to occur under the drip line of trees or in softscape areas that could otherwise be damaged.

- E. All of the above shall be observed and complied with by the Contractor and all workers on the Site. Failure to follow these directives could result in individual(s) being suspended or removed from the work force at the discretion of the District. The same rules and regulations shall apply equally to delivery personnel, inspectors, consultants, and other visitors to the Site.

**PART 2 - PRODUCTS Not Used.****PART 3 - EXECUTION Not Used.**

END OF DOCUMENT

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## SECTION 014010 DSA QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes administrative and procedural requirements for DSA-approved quality assurance and quality control.
- B. DSA-approved testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. A minimum Class II Project Inspector employed by the School District and approved by DSA shall provide continuous inspection of the work per Title 24 CCR, Part 1, Section 4-333. The duties of the Project Inspector are defined in Title 24 CCR, Part 1, Section 4-342.
  - 2. Testing and inspection shall comply with Title 24 CCR, Part 1, Section 4-335.
    - a. Required special tests and inspections shall comply with CBC Chapter 17A. Required special tests and inspections shall be as indicated in specifications, drawings and on the DSA-approved Form 103, 'Statement of Structural Tests and Special Inspections'.
    - b. A copy of the DSA 103 form is included at the end of this section.
  - 3. All testing and inspection laboratories shall be approved by DSA.
  - 4. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 5. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 6. Requirements for Contractor to provide quality-assurance and control services required by Architect, Owner, Construction Manager or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections:
  - 1. Divisions 02 through 33 Sections for specific test and inspection requirements.

#### 1.02 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

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- D. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: A DSA-approved entity engaged to perform specific tests, inspections, or both. DSA-approved testing agencies shall have a current DSA Laboratory Evaluation and Acceptance (LEA) program number. Testing laboratory shall mean the same as testing agency.
- I. 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, and similar operations.
  - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- K. Project Inspector: A Class I Project Inspector employed by the School District and approved by DSA shall provide continuous inspection of the work per Title 24 CCR, Part 1, Section 4-333. The duties of the Project Inspector are defined in Title 24 CCR, Part 1, Section 4-342. "Special Inspector" and "Inspector of Record" shall mean the same as Project Inspector.

#### 1.03 **CONFLICTING REQUIREMENTS**

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be 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.

#### 1.04 **INFORMATIONAL SUBMITTALS**

- A. Contractor's Statement of Responsibility: In accordance with CBC Section 1704A.4, submit copy of written statement of responsibility sent to DSA before starting work on the following systems.
  - 1. Seismic-force resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by the Architect or the Structural Engineer of Record.

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2. Main wind-force resisting system or a wind-resisting component listed in the wind-force-resisting system quality assurance plan prepared by the Architect or the Structural Engineer of Record.

#### 1.05 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports where specified in other Sections. Test and inspection reports shall comply with DSA reporting requirements for testing laboratories, as indicated in DSA reporting forms and templates numbers DSA-201 through DSA-293, inclusive. Where there is no DSA reporting template, test and inspection reports shall include the following:
  1. Date of issue.
  2. Project title and number.
  3. Name, address, and telephone number of testing agency.
  4. Dates and locations of samples and tests or inspections.
  5. Names of individuals making tests and inspections.
  6. Description of the Work and test and inspection method.
  7. Identification of product and Specification Section.
  8. Complete test or inspection data.
  9. Test and inspection results and an interpretation of test results.
  10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  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, and telephone number of technical representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
  1. Name, address, and telephone number of factory-authorized service representative making report.
  2. Statement that equipment complies with requirements.

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3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  4. Statement whether conditions, products, and installation will affect warranty.
  5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, 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.

#### 1.06 QUALITY ASSURANCE

- A. General: 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.
- 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, 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 are similar to those indicated for this Project in material, design, and extent.
- F. Testing Agency Qualifications: An agency with current DSA LEA program approval.
- G. 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.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. 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 responsibilities include the following:
    - 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.



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- d. Build mockups and site-assembled test assemblies using installers who will perform same tasks for Project.
  - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
  - f. When testing is complete, remove mockups, test specimens and 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, through Construction Manager, 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.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
  2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
  3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
  4. Demonstrate the proposed range of aesthetic effects and workmanship.
  5. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.
  6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  7. Demolish and remove mockups when directed, unless otherwise indicated.
- K. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.
- L. Room Mockups: Construct room mockups incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work. Provide room mockups of the following rooms:
- M. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections in Divisions 02 through 33.

#### 1.07 QUALITY CONTROL

- A. Owner Responsibilities: Owner will engage one or more DSA-approved, qualified testing agencies 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 inspecting 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.

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- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
  - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
  - 2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
  - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. 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 Division 01 Section "Submittal Procedures."
- D. 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.
- E. 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.
- F. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  - 2. Determine the location 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 any duties of Contractor.
- G. Associated Services: Cooperate with agencies 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.

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3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. 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 inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### **1.08 SPECIAL TESTS AND INSPECTIONS**

- A. Special Tests and Inspections: Owner will engage a DSA-approved, qualified testing agency and special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in DSA Form 103, "Statement of Structural Tests and Special Inspections" attached to this Section.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION**

#### **3.01 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 and Construction Manager's reference during normal working hours.

#### **3.02 REPAIR AND PROTECTION**

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

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

**END OF SECTION 014010.00**

## DOCUMENT 01 41 00

**REGULATORY REQUIREMENTS****PART 1 - GENERAL****1.01 RELATED DOCUMENTS AND PROVISIONS:**

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Obtaining of Permits, Licenses and Registrations and Work to Comply with All Applicable Laws and Regulations;
- B. Special Conditions; and
- C. Quality Control.

**1.02 DESCRIPTION:**

This section covers the general requirements for regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

**1.03 REQUIREMENTS OF REGULATORY AGENCIES:**

- A. All statutes, ordinances, laws, rules, codes, regulations, standards, and the lawful orders of all public authorities having jurisdiction over the Work, are hereby incorporated into these Contract Documents as if repeated in full herein and are intended to be included in any reference to Code or Building Code, unless otherwise specified, including, without limitation, the references in the list below. Contractor shall make available at the Site copies of all the listed documents applicable to the Work as the District and/or Architect may request, including, without limitation, applicable portions of the California Code of Regulations ("CCR").
  - (1) California Building Standards Administrative Code, Part 1, Title 24, CCR.
  - (2) California Building Code (CBC), Part 2, Title 24, CCR; (International Building Code volumes 1-2 and California Amendments).
  - (3) California Electrical Code (CEC), Part 3, Title 24, CCR; (National Electrical Code and California Amendments).
  - (4) California Mechanical Code (CMC), Part 4, Title 24, CCR; (Uniform Mechanical Code and California Amendments).
  - (5) California Plumbing Code (CPC), Part 5, Title 24, CCR; (Uniform Plumbing Code and California Amendments).

- (6) California Fire Code (CFC), Part 9, Title 24, CCR; (International Fire Code and California Amendments).
  - (7) California Referenced Standards Code, Part 12, Title 24, CCR.
  - (8) State Fire Marshal Regulations, Public Safety, Title 19, CCR.
  - (9) Partial List of Applicable National Fire Protection Association (NFPA) Standards:
    - (a) NFPA 13 - Automatic Sprinkler System.
    - (b) NFPA 14 - Standpipes Systems.
    - (c) NFPA 17A - Wet Chemical System
    - (d) NFPA 24 - Private Fire Mains.
    - (e) (California Amended) NFPA 72 - National Fire Alarm Codes.
    - (f) NFPA 253 - Critical Radiant Flux of Floor Covering System.
    - (g) NFPA 2001 - Clean Agent Fire Extinguishing Systems.
  - (10) California Division of the State Architect interpretation of Regulations ("DSA IR"), including, without limitation:
    - (a) DSA IR A-6 — Construction Change Document Submittal and Approval Processes.
    - (b) DSA IR A-7 — Project Inspector Certification and Approval.
    - (c) DSA IR A-8 — Project Inspector and Assistant Inspector Duties and Performance.
    - (d) DSA IR A-12 — Assistant Inspector Approval.
  - (11) DSA Procedures ("DSA PR")
    - (a) DSA PR 13-01 – Construction Oversight Process
    - (b) DSA PR 13-02 – Project Certification Process
- B. This Project shall be governed by applicable regulations, including, without limitation, the State of California's Administrative Regulations for the Division of the State Architect-Structural Safety (DSA/SS), Chapter 4, Part 1, Title 24, CCR, and the most current version on the date the bids are opened and as it pertains to school construction including, without limitation:
- (1) Test and testing laboratory per Section 4-335. District shall pay for the testing laboratory.
  - (2) Special inspections per Section 4-333(c).

- (3) Deferred Approvals per section 4-317(g).
- (4) Verified reports per Sections 4-336 & 4-343(c).
- (5) Duties of the Architect & Engineers shall be per Sections 4-333(a) and 4-341.
- (6) Duties of the Contractor shall be per Section 4-343.
- (7) Duties of Project Inspector shall be per Section 4-334.
- (8) Addenda and Construction Change Documents per Section 4-338.

Contractor shall keep and make available all applicable parts of the most current version of Title 24 referred to in the plans and specifications at the Site during construction.

- C. Items of deferred approval shall be clearly marked on the first sheet of the Architect's and/or Engineer's approved Drawings. All items later submitted for approval shall be per Title 24 requirements to the DSA.

- (1) Contractor shall submit the following to Architect for review and endorsement:
  - (a) Product information on proposed material/system supplier.
  - (b) Drawings, specifications, and calculations prepared, signed, and stamped by an architect or engineer licensed in the State of California for that portion of the Work.
  - (c) All other requirements as may be required by DSA.
- (2) Cost of preparing and submitting documentation per DSA Deferred Approval requirements including required modifications to Drawings and Specifications, whether or not indicated in the Contract Documents, shall be borne by Contractor.
- (3) Contractor shall not begin fabrication and installation of deferred approval items without first obtaining DSA approval of Drawings and Specifications.
- (4) Schedule of Work Subject to DSA Deferred Approval: Window wall systems exceeding 10 feet in span.

**PART 2 – PRODUCTS Not Used.**

**PART 3 – EXECUTION Not Used.**

END OF DOCUMENT

## DOCUMENT 01 42 13

**ABBREVIATIONS AND ACRONYMS****PART 1 – GENERAL****1.01 RELATED DOCUMENTS AND PROVISIONS:**

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions including without limitation, Definitions;
- B. Special Conditions.

**1.02 DOCUMENT INCLUDES:**

- A. Abbreviations used throughout the Contract Documents.
- B. Reference to a technical society, organization, or body is by abbreviation, as follows:

1.	AA	The Aluminum Association
2.	AAMA	American Architectural Manufacturers Association
3.	AASHTO	American Association of State Highway and Transportation Officials
4.	ABPA	Acoustical and Board Products Association
5.	ACI	American Concrete Institute
6.	AGA	American Gas Association
7.	AGC	Associated General Contractors of America
8.	AHC	Architectural Hardware Consultant
9.	AI	Asphalt Institute
10.	AIA	American Institute of Architects
11.	AIEE	American Institute of Electrical Engineers
12.	AISC	American Institute of Steel Construction
13.	AISI	American Iron and Steel Institute
14.	AMCA	Air Moving and Conditioning Association
15.	ANSI	American National Standards Institute
16.	APA	American Plywood Association
17.	ARI	Air Conditioning and Refrigeration Institute
18.	ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
19.	ASME	American Society of Mechanical Engineers
20.	ASSE	American Society of Structural Engineers
21.	ASTM	American Society of Testing and Materials
22.	AWPB	American Wood Preservers Bureau
23.	AWPI	American Wood preservers Institute
24.	AWS	American Welding Society
25.	AWSC	American Welding Society Code
26.	AWI	Architectural Woodwork Institute
27.	AWWA	American Water Works Association
28.	BIA	Brick Institute of America



29.	CCR	California Code of Regulations
30.	CLFMI	Chain Link Fence Manufacturers Institute
31.	CMG	California Masonry Guild
32.	CRA	California Redwood Association
33.	CRSI	Concrete Reinforcing Steel Institute
34.	CS	Commercial Standards
35.	CSI	Construction Specifications Institute
36.	CTI	Cooling Tower Institute
37.	FGMA	Flat Glass Manufacturer's Association
38.	FIA	Factory Insurance Association
39.	FM	Factory Mutual
40.	FS	Federal Specification
41.	FTI	Facing Title Institute
42.	GA	Gypsum Association
43.	ICC	International Code Council
44.	IEEE	Institute of Electrical and Electronic Engineers
45.	IES	Illumination Engineering Society
46.	LIA	Lead Industries Association
47.	MIA	Marble Institute of America
48.	MLMA	Metal Lath Manufacturers Association
49.	MS	Military Specifications
50.	NAAMM	National Association of Architectural Metal Manufacturers
51.	NBHA	National Builders Hardware Association
52.	NBFU	National Board of Fire Underwriters
53.	NBS	National Bureau of Standards
54.	NCMA	National Concrete Masonry Association
55.	NEC	National Electrical Code
56.	NEMA	National Electrical Manufacturers Association
57.	NFPA	National Fire Protection Association/National Forest Products Association
58.	NMWIA	National Mineral Wool Insulation Association
59.	NTMA	National Terrazzo and Mosaic Association
60.	NWMA	National Woodwork Manufacturer's Association
61.	ORS	Office of Regulatory Services (California)
62.	OSHA	Occupational Safety and Health Act
63.	PCI	Precast Concrete Institute
64.	PCA	Portland Cement Association
65.	PDCA	Painting and Decorating Contractors of America
66.	PDI	Plumbing Drainage Institute
67.	PEI	Porcelain Enamel Institute
68.	PG&E	Pacific Gas & Electric Company
69.	PS	Product Standards
70.	SDI	Steel Door Institute; Steel Deck Institute
71.	SJI	Steel Joist Institute
72.	SSPC	Steel Structures Painting Council
73.	TCA	Tile Council of America
74.	TPI	Truss Plate Institute
75.	UBC	Uniform Building Code
76.	UL	Underwriters Laboratories Code
77.	UMC	Uniform Mechanical Code
78.	USDA	United States Department of Agriculture
79.	VI	Vermiculite Institute

80.	WCLA	West Coast Lumberman's Association
81.	WCLB	West Coast Lumber Bureau
82.	WEUSER	Western Electric Utilities Service Engineering Requirements
83.	WIC	Woodwork Institute of California
84.	WPOA	Western Plumbing Officials Association

**PART 2 - PRODUCTS Not Used.**

**PART 3 - EXECUTION Not Used.**

END OF DOCUMENT

DOCUMENT 01 42 16

**DEFINITIONS**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS AND PROVISIONS**

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions including without limitation, Definitions;
- B. Special Conditions.

**1.02 QUALITY ASSURANCE**

- A. For products or workmanship specified by association, trade, or Federal Standards, Contractor shall comply with requirements of the standard, except when more rigid requirements are specified in the Contract Documents, or are required by applicable codes.
- B. Contractor shall conform to current reference standard publication date in effect on the date of bid opening.
- C. Contractor shall obtain copies of standards unless specifically required not to by the Contract Documents.
- D. Contractor shall maintain a copy of all standards at jobsite during submittals, planning, and progress of the specific Work, until final completion, unless specifically required not to by the Contract Documents.
- E. Should specified reference standards conflict with Contract Documents, Contractor shall request clarification from the District and/or the Architect before proceeding.
- F. The contractual relationship of the parties to the Contract shall not be altered from the contractual relationship as indicated in the Contract Documents by mention or inference otherwise in any referenced document.
- G. Governing Codes shall be as shown in the Contract Documents including, without limitation, the Specifications.

END OF DOCUMENT

## DOCUMENT 01 42 19

**REFERENCES****PART 1 - GENERAL****1.01 SCHEDULE OF REFERENCES:**

**The following information is intended only for the general assistance of the Contractor, and the District does not represent that all of the information is current. It is the Contractor's responsibility to verify the correct information for each of the entities listed.**

AA	The Aluminum Association 1400 Crystal Drive, Suite 430 Arlington, VA 22202 <a href="http://www.aluminum.org">www.aluminum.org</a>	703/358-2960
AABC	Associated Air Balance Council 1518 K Street, NW, Suite 503 Washington, DC 20005 <a href="http://www.aabc.com">www.aabc.com</a>	202/737-0202
AAMA	American Architectural Manufacturers Association 1827 Walden Office Sq., Suite 550 Schaumburg, IL 60173-4268 <a href="http://www.aamanet.org">www.aamanet.org</a>	847/303-5664
AASHTO	American Association of State Highway and Transportation Officials 444 N Capitol St. NW - Suite 249 Washington, DC 20001 <a href="http://www.transportation.org">www.transportation.org</a>	202/624-5800
AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215 One Davis Drive Research Triangle Park, NC 27709 2215 <a href="http://www.aatcc.org">www.aatcc.org</a>	919/549-8141
ACA	American Coatings Association 1500 Rhode Island Ave., NW Washington DC, 20005 <a href="http://www.paint.org">www.paint.org</a>	202/462-6272

ACI	American Concrete Institute 38800 Country Club Dr. Farmington Hills, MI 48331-3439 <a href="http://www.concrete.org">www.concrete.org</a>	248/848-3700
ACPA	American Concrete Pipe Association 8445 Freeport Parkway, Suite 350 Irving, TX 75063-2595 <a href="http://www.concrete-pipe.org">www.concrete-pipe.org</a>	972/506-7216
ADC	Air Duct Council 1901 N. Roselle Road, Suite 800 Schaumburg, Illinois 60195 <a href="http://www.flexibleduct.org">www.flexibleduct.org</a>	847/706-6750
AF&PA	American Forest and Paper Association 1101 K Street, NW, Suite 700 Washington, DC 20005 <a href="http://www.afandpa.org">www.afandpa.org</a>	202/463-2700
AGA	American Gas Association 400 North Capitol Street, NW Washington, DC 20001 <a href="http://www.aga.org">www.aga.org</a>	202/824-7000
AGC	Associate General Contractors of America 2300 Wilson Blvd., Suite 300 Arlington, VA 22201 <a href="http://www.agc.org">www.agc.org</a>	703/548-3118
AHA	American Hardboard Association 1210 West Northwest Highway Palatine, IL 60067 <a href="http://domensino.com/AHA/default.htm">domensino.com/AHA/default.htm</a>	847/934-8800
AI	Asphalt Institute 2696 Research Park Drive Lexington, KY 40511-8480 <a href="http://www.asphaltinstitute.org">www.asphaltinstitute.org</a>	859/288-4960
AIA	The American Institute of Architects 1735 New York Ave., NW Washington, DC 20006-5292 <a href="http://www.aia.org">www.aia.org</a>	202/626-7300
AISC	American Institute of Steel Construction 130 East Randolph Street Suite 2000 Chicago, IL 60601 <a href="http://www.aisc.org">www.aisc.org</a>	312.670.2400

AIA	American Insurance Association (formerly the National Board of Fire Underwriters) 555 12th St, NW, Suite 550 Washington DC 20004 www.aiadc.org	202/828-7100
AISI	American Iron and Steel Institute 25 Massachusetts Ave., NW, Suite 800 Washington, DC 20001 www.steel.org	202/452.7100
AITC	American Institute of Timber Construction 7012 S. Revere Parkway Suite 140 Centennial, CO 80112 www.aitc-glulam.org	503/639.0651
ALI	Associated Laboratories, Inc. P.O. Box 152837 Dallas, TX 75315 www.assoc-labs.com	214/565-0593
ALSC	American Lumber Standards Committee, Inc. 7470 New Technology Way, Suite F Frederick, MD 21703 www.alsc.org	301/972-1700
AMCA	Air Movement and Control Association International, Inc. 30 W. University Drive Arlington Heights, IL 60004 www.amca.org	847/394-0150
ANLA	American Nursery & Landscape Association (now AmericanHort) 525 9 <sup>th</sup> St NW, Suite 80 Washington, DC 20004 www.americanhort.org	202/789-2900
ANSI	American National Standards Institute 1899 L Street, NW, 11th Floor Washington, DC, 20036 www.ansi.org	202/293.8020
APA	APA-The Engineered Wood Association 7011 S. 19th Street Tacoma, WA 98466-5333 www.apawood.org	253/565-6600

APA	Architectural Precast Association 325 John Know Rd, Ste L103 Tallahassee, FL 32303 <a href="http://www.archprecast.org">www.archprecast.org</a>	850/205.5637
ARI	Air Conditioning and Refrigeration Institute (now Air-Conditioning, Heating, & Refrigeration Institute) 2111 Wilson Blvd, Suite 500 Arlington, VA 22201 <a href="http://www.ahrinet.org">www.ahrinet.org</a>	703/524-8800
ARMA	Asphalt Roofing Manufacturers Association Public Information Department 750 National Press Building 529 14th Street, NW Washington, DC 20045 <a href="http://www.asphaltroofing.org">www.asphaltroofing.org</a>	202/591-2450
ASA	The Acoustical Society of America ASA Office Manager Suite 1N01 2 Huntington Quadrangle Melville, NY 11747-4502 <a href="http://asa.aip.org">http://asa.aip.org</a>	516/576-2360
ASCE	American Society of Civil Engineers 1801 Alexander Bell Drive Reston, VA 20191 <a href="http://www.asce.org">www.asce.org</a>	800/548-2723 703/295-6300
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329-2305 <a href="http://www.ashrae.org">www.ashrae.org</a>	800/527-4723 404/636-8400
ASLA	American Society of Landscape Architects 636 Eye Street, NW Washington, DC 20001-3736 <a href="http://www.asla.org">www.asla.org</a>	202/898-2444
ASME	American Society of Mechanical Engineers Three Park Avenue New York, NY 10016-5990 <a href="http://www.asme.org">www.asme.org</a>	800/434-2763
ASPE	American Society of Plumbing Engineers 2980 S River Rd. Des Plaines, IL 60018 <a href="http://aspe.org">http://aspe.org</a>	847/296-0002

ASQ	American Society for Quality P.O. Box 3005 Milwaukee, WI 53201-3005 or 600 North Plankinton Avenue Milwaukee, WI 53203 <a href="http://asq.org">http://asq.org</a>	800/248-1946 414/272-8575
ASSE	American Society of Sanitary Engineering 901 Canterbury, Suite A Westlake, Ohio 44145 <a href="http://www.asse-plumbing.org">www.asse-plumbing.org</a>	440/835-3040
ASTM	ASTM International 100 Barr Harbor Drive PO Box C700 West Conshohocken, PA, 19428-2959 <a href="http://www.astm.org">www.astm.org</a>	610/832-9500
AWCI	Association of the Wall and Ceiling Industry 513 West Broad Street, Suite 210 Falls Church, VA 22046 <a href="http://www.awci.org">www.awci.org</a>	703/538-1600
AWPA	American Wood Protection Association P.O. Box 361784 Birmingham, AL 35236-1784 <a href="http://www.awpa.com">www.awpa.com</a>	205/733-4077
AWPI	American Wood Preservers Institute 2750 Prosperity Ave. Suite 550 Fairfax, VA 22031-4312 <a href="http://www.arcat.com">www.arcat.com</a>	800/356-AWPI 703/204-0500
AWS	American Welding Society 8669 Doral Boulevard, Suite 130 Doral, Florida 33166 <a href="http://www.aws.org">www.aws.org</a>	800/443-9353 305/443-9353
AWI	Architectural Woodwork Institute 46179 Westlake Drive, Suite 120 Potomac Falls, VA 20165-5874 <a href="http://www.awinet.org">www.awinet.org</a>	571/323-3636
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235 <a href="http://www.awwa.org">www.awwa.org</a>	800/926-7337 303/794 7711



BHMA	Builders Hardware Manufacturers Association 355 Lexington Avenue, 15th floor New York, NY 10017 <a href="http://www.buildershardware.com">www.buildershardware.com</a>	212/297-2122
BIA	The Brick Industry Association 1850 Centennial Park Drive, Suite 301 Reston, VA 20191 <a href="http://www.gobrick.com">www.gobrick.com</a>	703/620-0010
CGA	Compressed Gas Association 14501 George Carter Way, Suite 103 Chantilly VA 20151-2923 <a href="http://www.cganet.com">www.cganet.com</a>	703/788-2700
CISCA	Ceilings & Interior Systems Construction Association 1010 Jorie Blvd, Suite 30 Oak Brook, IL 60523 <a href="http://www.cisca.org">www.cisca.org</a>	630/584-1919
CISPI	Cast Iron Soil Pipe Institute 1064 Delaware Avenue SE Atlanta, GA 30316 <a href="http://www.cispi.org">www.cispi.org</a>	404/622-0073
CLFMI	Chain Link Fence Manufacturers Institute 10015 Old Columbia Road, Suite B-215 Columbia, MD 21046 <a href="http://www.associationsites.com/main-pub.cfm?usr=clfma">www.associationsites.com/main-pub.cfm?usr=clfma</a>	410/290-6267
CPA	Composite Panel Association 19465 Deerfield Avenue, Suite 306 Leesburg, VA 20176 <a href="http://www.compositepanel.org">www.compositepanel.org</a>	703/724-1128
CPSC	Consumer Product Safety Commission 4330 East West Highway Bethesda, MD 20814 <a href="http://www.cpsc.gov">www.cpsc.gov</a>	301/504-7923 800/638-2772
CRA	California Redwood Association 405 Enfrente Drive, Suite 200 Novato, CA 94949 <a href="http://www.calredwood.org">www.calredwood.org</a>	415/382-0662

CRI	Carpet and Rug Institute P.O. Box 2048 Dalton, Georgia 30722-2048 <a href="http://www.carpet-rug.org">www.carpet-rug.org</a>	706/278-3176
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road Schaumburg, IL 60173 4758 <a href="http://www.crsi.org">www.crsi.org</a>	847/517-1200
CSI	The Construction Specifications Institute 110 South Union Street, Suite 100 Alexandria VA 22314 <a href="http://www.csinet.org">www.csinet.org</a>	800/689-2900
CTIOA	Ceramic Tile Institute of America 12061 Jefferson Blvd. Culver City, CA 90230-6219 <a href="http://www.ctioa.org">www.ctioa.org</a>	310/574-7800
DHI	Door and Hardware Institute (formerly National Builders Hardware Association) 14150 Newbrook Dr. Chantilly, VA 20151 <a href="http://www.dhi.org">www.dhi.org</a>	703/222-2010
DIPRA	Ductile Iron Pipe Research Association 2000 2nd Avenue, South Suite 429 Birmingham, AL 35233 <a href="http://www.dipra.org">www.dipra.org</a>	205/402-8700
DOC	U.S. Department of Commerce 1401 Constitution Ave., NW Washington, D.C. 20230 <a href="http://www.commerce.gov">www.commerce.gov</a>	202/482-2000
DOT	U.S. Department of Transportation 1200 New Jersey Avenue, SE Washington, DC 20590 <a href="http://www.dot.gov">www.dot.gov</a>	855/368-4200
EJMA	Expansion Joint Manufacturers Association, Inc. 25 North Broadway Tarrytown, NY 10591 <a href="http://www.ejma.org">www.ejma.org</a>	914/332-0040

EPA	Environmental Protection Agency Ariel Rios Building 1200 Pennsylvania Avenue, N.W. Washington, DC 20460 <a href="http://www.epa.gov">www.epa.gov</a>	202/272-0167
FCICA	Floor Covering Installation Contractors Association 7439 Millwood Drive West Bloomfield, MI 48322 <a href="http://www.fcica.com">www.fcica.com</a>	248/661-5015 877/TO-FCICA
FM Global	Factory Mutual Insurance Company Amy Daley Global Practice Leader – Education, Public Entities, Health Care FM Global 270 Central Avenue Johnston, RI 02919-4949 <a href="http://www.fmglobal.com">www.fmglobal.com</a>	401/275-3000 401/275-3029
FS	General Services Administration (GSA) Index of Federal Specifications, Standards and Commercial Item Descriptions 470 East L'Enfant Plaza, SW, Suite 8100 Washington, DC 20407 <a href="http://www.gsa.gov">www.gsa.gov</a>	202/619-8925
GA	The Gypsum Association 6525 Belcrest Road, Suite 480 Hyattsville, MD 20782 <a href="http://www.gypsum.org">www.gypsum.org</a>	301/277-8686
GANA	Glass Association of North America 800 SW Jackson St., Suite 1500 Topeka, KS 66612-1200 <a href="http://www.glasswebsite.com">www.glasswebsite.com</a>	785/271-0208
HMA	Hardwood Manufacturers Association 665 Rodi Road, Suite 305 Pittsburgh, PA 15235 <a href="http://hmamembers.org">http://hmamembers.org</a>	412/244-0440
HPVA	Hardwood Plywood & Veneer Association 1825 Michael Faraday Drive Reston, Virginia 20190 <a href="http://www.hpva.org">www.hpva.org</a>	703/435-2900

IAPMO	International Association of Plumbing and Mechanical Officials (formerly the Western Plumbing Officials Association) 4755 E. Philadelphia St. Ontario, CA 91761 <a href="http://www.iapmo.org">www.iapmo.org</a>	909/472-4100
ICC	International Code Council 500 New Jersey Avenue, NW, 6th Floor Washington, DC 20001 <a href="http://www.iccsafe.org">www.iccsafe.org</a>	888/422-7233
IEEE	Institute of Electrical and Electronics Engineers 3 Park Avenue, 17th Floor New York, NY 10016-5997 <a href="http://www.ieee.org">www.ieee.org</a>	212/419-7900
IES	Illuminating Engineering Society 120 Wall Street, Floor 17 New York, NY 10005-4001 <a href="http://www.ies.org">www.ies.org</a>	212/248-5000
ITRK	Intertek Testing Services 3933 US Route 11 Cortland, NY 13045 <a href="http://www.intertek.com">www.intertek.com</a>	607/753-6711
MCAA	Mechanical Contractors Association of America 1385 Piccard Drive Rockville, MD 20850 <a href="http://www.mcaa.org">www.mcaa.org</a>	301/869-5800
MIA	Marble Institute of America 28901 Clemens Rd, Ste 100 Cleveland, OH 44145 <a href="http://www.marble-institute.com">www.marble-institute.com</a>	440/250-9222
MMPA (formerly WMMPA)	Moulding & Millwork Producers Association (formerly Wood Moulding & Millwork Producers Association) 507 First Street Woodland, CA 95695 <a href="http://www.wmmpa.com">www.wmmpa.com</a>	530/661-9591 800/550-7889

MSS	Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry 127 Park Street, NE Vienna, VA 22180-4602 <a href="http://mss-hq.org">http://mss-hq.org</a>	703/281-6613
NAAMM	National Association of Architectural Metal Manufacturers 800 Roosevelt Rd. Bldg. C, Suite 312 Glen Ellyn, IL 60137 <a href="http://www.naamm.org">www.naamm.org</a>	630/942-6591
NAIMA	North American Insulation Manufacturers Association 44 Canal Center Plaza, Suite 310 Alexandria, VA 22314 <a href="http://www.naima.org">www.naima.org</a>	703/684-0084
NAPA	National Asphalt Pavement Association 5100 Forbes Blvd. Lanham, MD USA 20706-4407 <a href="http://www.asphaltpavement.org">www.asphaltpavement.org</a>	888/468-6499 301/731-4748
NCSPA	National Corrugated Steel Pipe Association 14070 Proton Road, Suite 100 LB9 Dallas, TX 75244 <a href="http://www.ncspa.org">www.ncspa.org</a>	972/850-1907
NCMA	National Concrete Masonry Association 13750 Sunrise Valley Drive Herndon, VA 20171-4662 <a href="http://www.ncma.org">www.ncma.org</a>	703/713-1900
NEBB	National Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877 <a href="http://www.nebb.org">www.nebb.org</a>	301/977-3698
NECA	National Electrical Contractors Association 3 Bethesda Metro Center, Suite 1100 Bethesda, MD 20814 <a href="http://www.necanet.org">www.necanet.org</a>	301/657-3110
NEMA	National Electrical Manufacturers Association 1300 North 17th Street, Suite 1752 Rosslyn, Virginia 22209 <a href="http://www.nema.org">www.nema.org</a>	703/841-3200

NEII	National Elevator Industry, Inc. 1677 County Route 64 P.O. Box 838 Salem, New York 12865-0838 www.neii.org	518/854-3100
NFPA	National Fire Protection Association 1 Batterymarch Park Quincy, Massachusetts USA 02169-7471 www.nfpa.org	617/770-3000
NHLA	National Hardwood Lumber Association PO Box 34518 Memphis, TN 38184 www.nhla.com	901/377-1818
NIA	National Insulation Association 12100 Sunset Hills Road, Suite 330 Reston, VA 20190 www.insulation.org	703/464-6422
NRCA	National Roofing Contractors Association 10255 W. Higgins Road, Suite 600 Rosemont, IL 60018-5607 www.nrca.net	847/299-9070
NSF	NSF International P.O. Box 130140 789 N. Dixboro Road Ann Arbor, MI 48113-0140, USA www.nsf.org	800/673-6275 734/769-8010
NTMA	National Terrazzo and Mosaic Association PO Box 2605 Fredericksburg, TX 78624 www.ntma.com	800/323-9736
OSHA	Occupational Safety and Health Act U.S. Department of Labor Occupational Safety & Health Administration 200 Constitution Ave., NW Washington, D.C. 20210 www.osha.gov	800/321-OSHA (6742)

PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077 or 500 New Jersey Ave., N.W. 7 <sup>th</sup> Floor Washington, D.C. 20001 www.cement.org	847/966-6200 202/408-9494
PCI	Precast/Prestressed Concrete Institute 200 W. Adams St. #2100 Chicago, IL 60606 www.pci.org	312/786-0300
PDCA	Painting and Decorating Contractors of America 2316 Millpark Drive, Ste 220 Maryland Heights, MO 63043 www.pdca.com	800/332-PDCA (7322) 314/514-7322
PDI	Plumbing & Drainage Institute 800 Turnpike Street, Suite 300 North Andover, MA 01845 http://pdionline.org	978/557-0720 800/589-8956
PEI	Porcelain Enamel Institute, Inc. P.O. Box 920220 Norcross, GA 30010 www.porcelainenamel.com	770/676-9366
PG&E	Pacific Gas & Electric Company www.pge.com	800/743-5000
PLANET	Professional Landcare Network 950 Herndon Parkway, Suite 450 Herndon, Virginia 20170 www.landcarenetwork.org	703/736-9666 800/395-2522 703/736-9668
RFCI	Resilient Floor Covering Institute 115 Broad Street, Suite 201 La Grange GA 30240 www.rfci.com	706/882-3833
RIS	Redwood Inspection Service 818 Grayson Road, Suite 201 Pleasant Hill, CA 94523 www.redwoodinspection.com	925/935-1499
SDI	Steel Deck Institute P.O. Box 25 Fox River Grove, IL 60021 www.sdi.org	847/458-4647

SDI	Steel Door Institute 30200 Detroit Road Westlake, Ohio 44145 <a href="http://www.steeldoor.org">www.steeldoor.org</a>	440/899-0010
SJI	Steel Joist Institute 234 W. Cheves Street Florence, SC 29501 <a href="http://steeljoist.org">http://steeljoist.org</a>	843/407-4091
SMA	Stucco Manufacturers Association 500 East Yale Loop Irvine, CA 92614 <a href="http://www.stuccomfgassoc.com">www.stuccomfgassoc.com</a>	949/387.7611
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association 4201 Lafayette Center Drive Chantilly, Virginia 20151-1219 <a href="http://www.smacna.org">www.smacna.org</a>	703/803-2980
SPI	SPI: The Plastics Industry Trade Association, Inc. 1667 K St., NW, Suite 1000 Washington, DC 20006 <a href="http://www.plasticsindustry.org">www.plasticsindustry.org</a>	202/974-5200
SSPC	Society for Protective Coatings (formerly the Steel Structures Painting Council) 40 24th St 6th Fl Pittsburgh, PA 15222 <a href="http://www.sspc.org">www.sspc.org</a>	412/281-2331 877/281-7772
TCA	The Tile Council of North America 100 Clemson Research Blvd. Anderson, SC 29625 <a href="http://www.tcnatile.com">www.tcnatile.com</a>	864/646-8453
TPI	Truss Plate Institute 218 North Lee Street, Suite 312 Alexandria, VA 22314 <a href="http://www.tpinst.org">www.tpinst.org</a>	703/683-1010
TPI	Turfgrass Producers International 2 East Main Street East Dundee, IL 60118 <a href="http://www.turfgrasssod.org">www.turfgrasssod.org</a>	800/405-8873 847/649-5555



TCIA	Tree Care Industry Association (formerly the National Arborist Association) 136 Harvey Road, Suite 101 Londonderry, NH 03053 <a href="http://www.tcia.org">www.tcia.org</a>	800/733-2622
TVI	The Vermiculite Institute c/o The Schundler Company 150 Whitman Avenue Edison, NJ. 08817 <a href="http://www.vermiculiteinstitute.org">www.vermiculiteinstitute.org</a>	732/287-2244
UL	Underwriters Laboratories Inc. 333 Pfingsten Road Northbrook, IL 60062-2096 <a href="http://www.ul.com">www.ul.com</a>	847/272-8800 877/854-3577
UNI	Uni-Bell PVC Pipe Association 2711 LBJ Freeway, Suite 1000 Dallas, TX 75234 <a href="http://www.uni-bell.org">www.uni-bell.org</a>	972/243-3902
USDA	U.S. Department of Agriculture 1400 Independence Ave., S.W. Washington, DC 20250 <a href="http://www.usda.gov">www.usda.gov</a>	202/720-2791
WA	Wallcoverings Association 401 North Michigan Avenue Suite 2200 Chicago, IL 60611 <a href="http://www.wallcoverings.org">www.wallcoverings.org</a>	312/321-5166

WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281 or 6980 S.W. Varns Tigard, OR 97223 www.wclib.org	503/639-0651
WCMA	Window Covering Manufacturers Association 355 Lexington Avenue 15th Floor New York, New York 10017 www.wcmanet.org	212/297-2122
WDMA	Window & Door Manufacturers Association 401 N. Michigan Avenue, Suite 2200 Chicago, IL 60611 or 2025 M Street, NW, Ste. 800 Washington, D.C. 20036-3309 www.wdma.com	312/321-6802 202/367-1157
WI	Woodwork Institute P.O. Box 980247 West Sacramento, CA 95798 www.wicnet.org	916/372-9943
WRI	Wire Reinforcement Institute 942 Main Street Hartford, CT 06103 www.wirereinforcementinstitute.org	860/240-9545
WWCA	Western Wall & Ceiling Contractors Association 1910 N. Lime St. Orange, California 92865 www.wwcca.org	714/221-5520
WWPA	Western Wood Products Association 522 SW Fifth Ave., Suite 500 Portland, OR 97204-2122 www2.wwpa.org	503/224-3930

**PART 2 - PRODUCTS Not Used.****PART 3 - EXECUTION Not Used.**

END OF DOCUMENT

## DOCUMENT 01 43 00

**MATERIALS AND EQUIPMENT****PART 1 - GENERAL****1.01 RELATED DOCUMENTS AND PROVISIONS**

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Purchase of Materials and Equipment;
- B. Special Conditions;
- C. Imported Materials Certification.

**1.02 MATERIAL AND EQUIPMENT**

- A. Only items approved by the District and/or Design Professional shall be used.
- B. Contractor shall submit lists of products and other product information in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

**1.03 MATERIAL AND EQUIPMENT COLORS**

- A. The District and/or Architect will provide a schedule of colors.
- B. No individual color selections will be made until after approval of all pertinent materials and equipment and after receipt of appropriate samples in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.
- C. Contractor shall request priority in writing for any item requiring advance ordering to maintain the approved Construction Schedule.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Contractor shall deliver manufactured materials in original packages, containers, or bundles (with seals unbroken), bearing name or identification mark of manufacturer.
- B. Contractor shall deliver fabrications in as large assemblies as practicable; where specified as shop-primed or shop-finished, package or crate as required to preserve such priming or finish intact and free from abrasion.
- C. Contractor shall store materials in such a manner as necessary to properly protect them from damage. Materials or equipment damaged by handling, weather, dirt, or from any other cause will not be accepted.

- D. Materials are not acceptable that have been warehoused for long periods of time, stored or transported in improper environment, improperly packaged, inadequately labeled, poorly protected, excessively shipped, deviated from normal distribution pattern, or reassembled.
- E. Contractor shall store material so as to cause no obstructions of sidewalks, roadways, access to the Site or buildings, and underground services. Contractor shall protect material and equipment furnished under Contract.
- F. Contractor may store materials on Site with prior written approval by the District, all material shall remain under Contractor's control and Contractor shall remain liable for any damage to the materials. Should the Project Site not have storage area available, the Contractor shall provide for off-site storage at a bonded warehouse and with appropriate insurance coverage at no cost to District.
- G. When any room in Project is used as a shop or storeroom, the Contractor shall be responsible for any repairs, patching, or cleaning necessary due to that use. Location of storage space shall be subject to prior written approval by District.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Manufacturers listed in various sections of Contract Documents are names of those manufacturers that are believed to be capable of supplying one or more of items specified therein.
- B. The listing of a manufacturer does not imply that every product of that manufacturer is acceptable as meeting the requirements of the Contract Documents.

### **2.02 FACILITIES AND EQUIPMENT**

Contractor shall provide, install, maintain, and operate a complete and adequate facility for handling, the execution, disposal, and distribution of material and equipment as required for proper and timely performance of Work connected with Contract.

### **2.03 MATERIAL REFERENCE STANDARDS**

Where material is specified solely by reference to "standard specifications" and if requested by District, Contractor shall submit for review data on actual material proposed to be incorporated into Work of Contract listing name and address of vendor, manufacturer, or producer, and trade or brand names of those materials, and data substantiating compliance with standard specifications.

**PART 3 - EXECUTION****3.01 WORKMANSHIP**

- A. Where not more specifically described in any other Contract Documents, workmanship shall conform to methods and operations of best standards and accepted practices of trade or trades involved and shall include items of fabrication, construction, or installation regularly furnished or required for completion (including finish and for successful operation, as intended).
- B. Work shall be executed by tradespersons skilled in their respective lines of Work. When completed, parts shall have been durably and substantially built and present a neat appearance.

**3.02 COORDINATION**

- A. Contractor shall coordinate installation of Work so as to not interfere with installation of others. Adjustment or rework because of Contractor's failure to coordinate will be at no additional cost to District.
- B. Contractor shall examine in-place work for readiness, completeness, fitness to be concealed or to receive other work, and in compliance with Contract Documents. Concealing or covering Work constitutes acceptance of additional cost which will result should in-place Work be found unsuitable for receiving other Work or otherwise deviating from the requirements of the Contract Documents.

**3.03 COMPLETENESS**

Contractor shall provide all portions of the Work, unless clearly stated otherwise, installed complete and operational with all elements, accessories, anchorages, utility connections, etc., in manner to assure well-balanced performance, in accordance with manufacturer's recommendations and by Contract Documents. For example, electric water coolers require water, electricity, and drain services; roof drains require drain system; sinks fit within countertop, etc. Terms such as "installed complete," "operable condition," "for use intended," "connected to all utilities," "terminate with proper cap," "adequately anchored," "patch and refinish," "to match similar," should be assumed to apply in all cases, except where completeness of functional or operable condition is specifically stated as not required.

**3.04 APPROVED INSTALLER OR APPLICATOR**

Installation by a manufacturer's approved installer or applicator is an understood part of Specifications and only approved installer or applicator is to provide on-site Work where specified manufacturer has on-going program of approving (i.e. certifying, bonding, re-warranting) installers or applicators. Newly established relationships between a manufacturer and an installer or applicator who does not have other approved applicator work in progress or completed is not approved for this Project.

### **3.05 MANUFACTURER'S RECOMMENDATIONS**

All installations shall be in accordance with manufacturer's published recommendations and specific written directions of manufacturer's representative. Should Contract Documents differ from recommendations of manufacturer or directions of his representative, Contractor shall analyze differences, make recommendations to the District and the Architect in writing, and shall not proceed until interpretation or clarification has been issued by the District and/or the Architect.

END OF DOCUMENT

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## SECTION 015000 TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections:
  - 1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.
  - 2. Division 01 Section "Closeout Procedures" for final cleaning requirements and for cleaning permanent HVAC ducts used during construction.
  - 3. Division 01 Section "Construction Waste Management and Disposal" for requirements for project waste materials.

#### 1.02 DEFINITIONS

- A. Project Completion: Final Completion.

#### 1.03 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Water 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. Existing Sewer Service Systems: Owner's existing sewer system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- D. Existing Storm Drain Systems: Owner's existing storm drain system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- E. Existing Power Service: Owner's existing power service is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

#### 1.04 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
  - 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
- D. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to

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permit installation of finish materials.

- E. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
  - 1. Locations of dust-control partitions at each phase of the work.
  - 2. Location of proposed air filtration system discharge.
  - 3. Other dust-control measures.
  - 4. Waste management plan.

#### 1.05 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with CEC.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable accessibility provisions in the following documents:
  - 1. As indicated on drawings.
  - 2. 2016 CBC Chapter 11B.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide concrete or galvanized steel bases for supporting posts. Provide windscreen.

#### 2.02 TEMPORARY FACILITIES

- A. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, Construction Manager, 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 ten individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
  - 3. Project Testing & Inspection Office: Provide separate lockable room for use by Owner and Owner's Inspector of Record. Provide (2) tables, chair and file cabinet. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Provide separate outside phone line with DSL connectivity.
  - 4. Drinking water and private toilet.
  - 5. Coffee machine and supplies.
  - 6. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).



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7. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- B. 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.

## 2.03 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. Permanent HVAC System: If Owner, at Contractor request, authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system, remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures".

## PART 3 - EXECUTION

### 3.01 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 Division 01 Section "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.

### 3.02 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. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- C. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
  1. Install electric power service overhead, unless otherwise indicated.
- D. 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.
- E. Electronic Communication Service: 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. Processor: Intel Pentium D or Intel CoreDuo, 3.0 GHz processing speed.
  2. Memory: 4 gigabyte.
  3. Disk Storage: 300 gigabyte hard-disk drive and combination DVD-RW/CD-RW drive.
  4. Display: 19-inch (480-mm) LCD monitor with 128 Mb dedicated video RAM.
  5. Full-size keyboard and mouse.
  6. Network Connectivity: 10/100BaseT Ethernet.

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7. Operating System: Microsoft Windows XP Professional or Microsoft Windows Vista Business.
8. Productivity Software:
  - a. Microsoft Office Professional, XP or higher, including Word, Excel, and Outlook.
  - b. Adobe Reader 7.0 or higher.
9. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these 3 functions.
10. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 384 Kbps upload and 1 Mbps download speeds at each computer.
11. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing and spam protection in a combined application.

### 3.03 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
  1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
- B. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
  1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
  2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
  3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
  4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."
  5. Delay installation of seal coats for hot-mix asphalt pavement until immediately before Project Completion. Repair hot-mix asphalt pavement before installation of seal coats according to Division 32 Section "Asphalt Paving."
- C. 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.
- D. Parking: Provide temporary parking areas for construction personnel.
- 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 touchup signs so they are legible at all times.

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- F. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."
- G. 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 Division 01 Section "Execution" for progress cleaning requirements.
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

### 3.04 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.
- 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 Division 01 Section "Summary."
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings, requirements of 2003 EPA Construction General Permit, California State Water Resources Control Board and local authorities having jurisdiction, whichever is more stringent, and requirements specified in Division 31 Section "Site Clearing".
  - 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
  - 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
  - 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from the project site during the course of the project.
  - 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
  - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations, unless otherwise indicated on Drawings.
  - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.
- F. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

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- G. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- H. 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.
  - 1. Prohibit smoking in construction areas.
  - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  - 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.

### **3.05 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. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Project 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 Project 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. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
  - 3. At Project Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

**END OF SECTION 015000.00**

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## SECTION 015639 TEMPORARY TREE AND PLANT PROTECTION

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Tree protection of existing trees and plants
- B. Tree pruning of existing trees

#### 1.02 RELATED REQUIREMENTS

- A. Division 01 Section - Temporary Facilities and Controls
- B. Division 31 Section - Site Clearing
- C. Division 32 Section - Landscape Work

#### 1.03 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape or the average of the smallest and largest diameters at 6 inches (150 mm) above the ground for trees up to, and including, 4-inch (100-mm) size; and 12 inches (300 mm) above the ground for trees larger than 4-inch (100-mm) size.
- B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.
- C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings.
- D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

#### 1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of the following:
  - 1. Organic Mulch: 1-pint (0.5-L) 1-quart (1-L) volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
  - 2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
  - 3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.
- 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. Qualification Data: For qualified arborist and tree service firm.
- E. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- F. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

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- G. 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 videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

#### 1.05 QUALITY ASSURANCE

- A. Arborist Qualifications:

1. Certified Arborist as certified by ISA.
2. Licensed Arborist in jurisdiction where Project is located.

- 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. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
  - a. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
  - b. Enforcing requirements for protection zones.
  - c. Arborist's responsibilities.
  - d. Contractor responsibilities
  - e. Field quality control.

#### 1.06 PROJECT CONDITIONS

- A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or trenching or digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
8. Do not direct vehicle or equipment exhaust toward protection zones.
9. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. Topsoil: Natural or cultivated top layer of the soil profile or manufactured topsoil; containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch (25 mm) Insert dimension in diameter; and free of weeds, roots, and toxic and other nonsoil materials.

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1. Obtain topsoil only from well-drained sites where topsoil is 4 inches (100 mm) deep or more; do not obtain from bogs or marshes.
2. Refer to Section 32 Landscape Work for material requirements.
- B. Topsoil: Stockpiled topsoil from location shown on Drawings.
- C. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
  1. Type: Wood and bark chips.
  2. Size Range: 1/2" inch minimum, 1" maximum.
  3. Color: Natural.
- D. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements. Previously used materials may be used when approved by Architect.
  1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch (50-mm) opening, 0.148-inch- (3.76-mm-) diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- (60-mm-) OD line posts, and 2-7/8-inch- (73-mm-) OD corner and pull posts; with 1-5/8-inch- (42-mm-) OD top rails and 0.177-inch- (4.5-mm-) diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
    - a. Height: 6 feet (1.8 m).
    - b. Polymer-Coating Color: Black.
  2. Gates: Single swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width 36 inches (914 mm).
- E. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes pre-punched and reinforced; legibly printed with nonfading lettering and as follows:
  1. Size: as required
  2. Text: "TREE PROTECTION ZONE - KEEP OUT. No unauthorized entry. No storage of vehicles, materials, or debris. No dumping of chemicals, slurry, paint, oil, etc. "
  3. Lettering: 3-inch (75-mm-)high minimum, black characters on white background.

### **PART 3 - EXECUTION**

#### **3.01 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. For the record, prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

#### **3.02 PREPARATION**

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag - Tie a 1-inch (25-mm) blue-vinyl tape around each tree trunk at 54 inches (1372 mm) above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated.

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1. Apply 3-inch (100-mm) average thickness of organic mulch. Do not place mulch within 6 inches (150 mm) of tree trunks.

### 3.03 TREE- AND PLANT-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 area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
  1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
  2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to 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.
- B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 35 feet (10.5 m) 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. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
- 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.

### 3.04 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Division 31 Section "Earth Moving."
- B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only roots smaller than 2" in diameter that interfere with installation of utilities. Cut roots as required for root pruning.
- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist



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condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

### 3.05 ROOT PRUNING

- A. Prune 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. Coat cut ends of roots more than 1-1/2 inches (38 mm) in diameter with emulsified asphalt or other coating formulated for use on damaged plant tissues as approved by the arborist.
  - 3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
  - 4. Cover exposed roots with burlap and water regularly.
  - 5. Backfill as soon as possible according to requirements in Division 31 Section "Grading"
- B. Root Pruning at Edge of Protection Zone: Prune roots 12 inches (300 mm) 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 to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

### 3.06 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches as follows:
  - 1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
  - 2. Pruning Standards: Prune trees according to ANSI A300 (Part 1) and the following:
    - a. Type of Pruning: Cleaning Thinning Raising Reduction.
  - 3. Cut branches with sharp pruning instruments; do not break or chop.
  - 4. Do not apply pruning paint to wounds.
- B. Chip removed branches and dispose of off-site.

### 3.07 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.

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- D. Minor Fill within Protection Zone: Where existing grade is 4 inches (50 mm) or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

### 3.08 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.

### 3.09 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
  1. Submit details of proposed root cutting and tree and shrub repairs.
  2. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
  3. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
  4. Perform repairs within 24 hours.
  5. Replace vegetation 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 66 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. Provide new trees of same size and species as those being replaced for each tree that measures 4 inches (100 mm) or smaller in caliper size.
  2. Provide one new tree(s) of 6-inch (150-mm) caliper size for each tree being replaced that measure more than 4 inches (100 mm) in caliper size.
    - a. Species: Species selected by Architect.
  3. Plant and maintain new trees as specified in Division 32 Section "Landscape Work"
- C. Soil Aeration: Where directed by Architect, aerate surface soil compacted during construction. Aerate 10 feet (3 m) beyond drip line and no closer than 36 inches (900 mm) to tree trunk. Drill 2-inch (50-mm-) diameter holes a minimum of 12 inches (300 mm) deep at 24 inches (600 mm) O.C. Backfill holes with an equal mix of native soil and sand.

### 3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

**END OF SECTION**

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## SECTION 015713 TEMPORARY EROSION AND SEDIMENT CONTROL

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

#### 1.02 RELATED REQUIREMENTS

- A. Section 311000 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.
- B. Section 312200 - Grading: Temporary and permanent grade changes for erosion control.
- C. Storm Water Pollution Prevention Plan (SWPPP).

#### 1.03 REFERENCE STANDARDS

- A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus 2014 (Reapproved 2018).
- B. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity. 1999a (Reapproved 2014).
- C. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles 2011.
- D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles 2015a.
- E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile 2016.
- F. ASTM D4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples 2002 (Reapproved 2009).
- G. California State Water Resources Control Board, Construction General Permit; current edition.
- H. California Stormwater Quality Association (CASQA), California Stormwater Best Management Practice (BMP) Handbook; current edition.
- I. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit Current Edition.

#### 1.04 PERFORMANCE REQUIREMENTS

- A. Comply with all requirements of agencies for erosion and sedimentation control.
- B. Best Management Practices Standard: CASQA Stormwater BMP Handbook.
- C. Comply with the requirements of the project Storm Water Pollution Prevention Plan (SWPPP).
- D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
  - 1. Owner shall obtain permits and pay for securities required by authority having jurisdiction.

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2. Owner shall withhold payment to Contractor equivalent to all fines resulting from non-compliance with applicable regulations.
- E. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- F. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
  1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
- G. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
  1. Control movement of sediment and soil from temporary stockpiles of soil.
  2. Prevent development of ruts due to equipment and vehicular traffic.
  3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- H. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
  1. Prevent windblown soil from leaving the project site.
  2. Prevent tracking of mud onto public roads outside site.
  3. Prevent mud and sediment from flowing onto sidewalks and pavements.
  4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- I. Open Water: Prevent standing water that could become stagnant.
- J. Maintenance: Maintain temporary preventive measures until permanent measures have been established.
- K. Penalties and Fines: The Contractor is responsible for all penalties and fines assessed to or levied on the project related to stormwater management.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Use materials that conform to California Stormwater Quality Association (CASQA) and the California Stormwater Best Management Practice (BMP) Handbook, current edition.
- B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

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### 3.02 PREPARATION

- A. The project SWPPP shall be prepared and electronically uploaded to the State Water Board's SMARTS system database by the District's Qualified SWPPP Developer (QSD), the District's Approved Signatory (AS), or by a data submitter as designated by the District.
- B. The Contractor shall employ the services of a Qualified SWPPP Practitioner (QSP). The QSP shall download copies of the approved SWPPP from the State, and is responsible for implementation and enforcement of the SWPPP and the Erosion Control Plan. At least one (1) copy of the SWPPP shall be available at the site at all times.
- C. The QSP is responsible for training of personnel for proper implementation of the SWPPP, monitoring, and all required reports.
- D. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

### 3.03 INSTALLATION

- A. The Contractor shall implement preventative measures in accordance with the SWPPP and as required by the State Water Board.
- B. Temporary Seeding:
  - 1. When hydraulic seeder is used, seedbed preparation is not required.
  - 2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
  - 3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft (0.5 kg per 100 sq m).
  - 4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft (6 to 8 kg per 100 sq m).
  - 5. Incorporate fertilizer into soil before seeding.
  - 6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch (12 to 25 mm) deep.
  - 7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
  - 8. Repeat irrigation as required until grass is established.

### 3.04 MAINTENANCE

- A. Inspect preventive measures as required by the SWPPP and the State Water Board.
- B. Repair deficiencies immediately.
- C. Clean out temporary sediment control structures and relocate soil on site.
- D. Place sediment in appropriate locations on site; do not remove from site.

### 3.05 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by the Owner's representative.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

### 3.06 SWPPP CLOSE-OUT

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- A. Within 90 days of construction completion, the QSP shall electronically file a Notice of Termination (NOT) in the Stormwater Multiple Application and Report Tracking System (SMARTS) online.
- B. The QSP shall provide a Final Site Map for inclusion with the NOT. The Final Site Map shall provide sufficient information, including photos, to demonstrate compliance with the Permit regarding final site stabilization. All photo locations and directions shall be identified on the Final Site map. All photos shall be clearly labeled.
- C. The QSP is responsible for filing the Annual Report.

**END OF SECTION**

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## SECTION 016000 PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.01 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 012500 "Substitution Procedures".
  - 2. Section 013300 "Submittal Procedures".
  - 3. Section 014010 "DSA Quality Requirements".
  - 4. Section 014213 "Abbreviations, Symbols and Acronyms" for applicable industry standards for products specified.

#### 1.02 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, which is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

#### 1.03 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles. **Read PART 3 carefully.**
  - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
  - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
    - a. Form of Approval: As specified in Section 013300 "Submittal Procedures."

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- b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

#### 1.04 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.

#### 1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

#### 1.06 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
  - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.



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2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for 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. 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."

#### 1.07 CLOSEOUT SUBMITTALS

- A. Contractor and subcontractors shall certify that no asbestos containing materials and no lead base paint were used in this project. Certification letter must be addressed to Owner, including project and Contractors' information; to be notarized.

### PART 2 - PRODUCTS

#### 2.01 NON- ASBESTOS PRODUCTS

- A. No asbestos or asbestos containing materials or lead base paint may be used in this project or in any tools, devices, clothing or equipment used to affect this construction. All work or materials found to contain asbestos, or material installed with asbestos containing equipment or lead base paint will be immediately rejected and this work will be removed by a certified EPA hazard material Contractor under the supervision of a certified hazard material consultant at no additional cost to Owner.

#### 2.02 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 not in conflict with requirements of the Contract Documents.
  4. Where products are accompanied by the term "as selected," Architect will make selection.
  5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
  6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
  1. 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.
  2. 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.

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3. Products:
  - a. Restricted List: 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 unless otherwise indicated.
4. Manufacturers:
  - a. Restricted List: 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 unless otherwise indicated.
5. 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 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.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
  1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 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 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.

## 2.03 COMPARABLE PRODUCTS

- A. Conditions for Consideration: 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 these requirements:
  1. Evidence that the proposed product does not require revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  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.

## PART 3 - EXECUTION

### 3.01 CONTRACT DOCUMENT REVISIONS

- A. Should a Contractor-initiated proposed substitution, alternative sequence, method of construction, products listed or equivalent other than the Basis of Design product shown involves engineering, feasibility, scope or cost, that require a revision of the Contract

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Drawings or Specifications for the purpose of obtaining review and approval by Authorities Having Jurisdiction (AHJ), the Contractor accepts and agrees to the following:

1. Services of the Architect, his consultants, and / or other District's consultants who are the responsible design professionals, for researching and reporting on proposed substitutions or alternative sequence and method of construction shall be paid by Contractor in Time and Materials basis.
2. Costs related to the Services by the Architect, his consultants, and / or other District's consultants who are the responsible design professionals, for any expenses such as, but not limited to reproduction, long distance telephone, traveling and shipping costs, to be reimbursable at cost plus usual and customary mark-up for handling and billing.
3. Such fees shall be paid by Contactor whether or not the proposed substitution or alternative sequence or method of construction is ultimately accepted by Authorities Having Jurisdiction (AHJ) and / or the District.
4. Such fees shall be paid from Contractor's portion of savings from the proposed change, if a net reduction in Contract Sum results. If fees exceed Contractor's portion of net reduction, Contractor shall pay all remaining fees.

**END OF SECTION 016000**

DOCUMENT 01 64 00

**OWNER-FURNISHED PRODUCTS**

**PART 1 – GENERAL**

**1.01 RELATED DOCUMENTS AND PROVISIONS**

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions; and
- C. Materials and Equipment.

**1.02 SECTION INCLUDES**

- A. Requirements for the following:
  - (1) Installing Owner-furnished materials and equipment.
  - (2) Providing necessary utilities, connections and rough-ins.

**1.03 DEFINITIONS**

- A. Owner: District, who is providing/furnishing materials and equipment.
- B. Installing Contactor: Contractor, who is installing the materials and equipment furnished by the Owner.

**1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. Receive, store and handle products in accordance with the manufacturer's instructions.
- B. Protect equipment items as required to prevent damage during storage and construction.

**PART 2 – PRODUCTS**

**2.01 GENERAL PRODUCT REQUIREMENTS**

- A. Installing Contractor's Responsibilities:
  - (1) Verify mounting and utility requirements for Owner-furnished materials and equipment items.
  - (2) Provide mounting and utility rough in for all items where required.

- (a) Rough in locations, sizes, capacities, and similar type items shall be as indicated and required by product manufacturer.
- B. Owner and Installing Contractor(s) Responsibilities:
  - (1) Owner-Furnished/Contractor Installed ("OFCI"): Furnished by the Owner; installed by the Installing Contractor.
    - (a) General: Owner and Installing Contractor(s) will coordinate deliveries of materials and equipment to coincide with the construction schedule.
    - (b) Owner will furnish specified materials and equipment delivered to the site. Owner/vendor's representative shall be present on Site at the time of delivery to comply with the contract requirements and Specifications Section 01 43 00, Materials and Equipment, Article 1.04.
    - (c) The Owner furnishing specified materials and equipment is responsible to provide manufacturer guarantees as required by the Contract to the Installing Contractor.
    - (d) The Installing Contractor shall:
      - 1) Review, verify and accept the approved manufacturer's submittal/Shop Drawings for all materials and equipment required to be installed by the Installer Contractor and furnished by the Owner. Any discrepancies, including but not limited to possible space conflicts, should be brought to the attention of the Project Manager and/or Program Manager, if applicable.
      - 2) Coordinate timely delivery. Installing Contractor shall receive materials and equipment at Site when delivered and give written receipt at time of delivery, noting visible defects or omissions; if such declaration is not given, the Installing Contractor shall assume responsibility for such defects and omissions.
      - 3) Store materials and equipment until ready for installation and protect from loss and damage. Installing Contractor is responsible for providing adequate storage space.
      - 4) Coordinate with other bid package contractors and field measurement to ensure complete installation.
      - 5) Uncrate, assemble, and set in place.
      - 6) Provide adequate supports.
      - 7) Install materials and equipment in accordance with manufacturer's recommendations, instructions, and

Shop Drawings, supply labor and material required, and make mechanical, plumbing, and electrical connections required to operate equipment.

- 8) Be certified by equipment manufacturer for installation of the specific equipment supplied by the Owner.
- 9) Provide anchorage and/or bracing as required for seismic restraint per Title 24, UBC Standard 27-11 and all other applicable codes.
- 10) Provide the contract-required warranty and guarantee for all work, materials and equipment, and installation upon its completion and acceptance by the District. Guarantee includes all costs associated with the removal, shipping to and from the Site, and re-installation of any equipment found to be defective.

C. Compatibility with Space and Service Requirements:

- (1) Equipment items shall be compatible with space limitations indicated and as shown on the Contract Documents and specified in other sections of the Specifications.
- (2) Modifications to equipment items required to conform to space limitations specified for rough in shall not cause additional cost to the District.

D. Manufacturer's printed descriptions, specifications, and instructions shall govern the Work unless specifically indicated or specified otherwise.

## **2.02 FURNISHED MATERIALS AND EQUIPMENT**

- A. All furnished materials and equipment are indicated or scheduled on the Contract Documents.

## **PART 3 – EXECUTION**

### **3.01 INSTALLATION**

- A. Install equipment items in accordance with the manufacturer's instructions.
- B. Set equipment items securely in place, rigidly or flexibly mounted in accordance with manufacturers' directions.
- C. Make electrical and mechanical connections as indicated and required.
- D. Touch-up and restore damaged or defaced finishes to the Owner's satisfaction.

### **3.02 CLEANING AND PROTECTION**

- A. Repair or replace items not acceptable to the Architect or Owner.

- B. Upon completion of installation, clean equipment items in accordance with manufacturer's recommendations, and protect from damage until final acceptance of the Work by the Owner.

END OF DOCUMENT

## SECTION 01 66 00

**PRODUCT DELIVERY, STORAGE AND HANDLING****PART 1 - GENERAL****1.01 RELATED DOCUMENTS AND PROVISIONS**

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Site Access, Conditions and Requirements;
- B. Special Conditions.

**1.02 PRODUCTS**

- A. Products are as defined in the General Conditions.
- B. Contractor shall not use and/or reuse materials and/or equipment removed from existing Premises, except as specifically permitted by the Contract Documents.
- C. Contractor shall provide interchangeable components of the same manufacturer, for similar components.

**1.03 TRANSPORTATION AND HANDLING**

- A. Contractor shall transport and handle Products in accordance with manufacturer's instructions.
- B. Contractor shall promptly inspect shipments to confirm that Products comply with requirements, quantities are correct, and products are undamaged.
- C. Contractor shall provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

**1.04 STORAGE AND PROTECTION**

- A. Contractor shall store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Contractor shall store sensitive products in weather-tight, climate controlled enclosures.
- B. For exterior storage of fabricated Products, Contractor shall place on sloped supports, above ground.
- C. Contractor shall provide off-site storage and protection when Site does not permit on-site storage or protection.



- D. Contractor shall cover products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.
- E. Contractor shall store loose granular materials on solid flat surfaces in a well-drained area and prevent mixing with foreign matter.
- F. Contractor shall provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- G. Contractor shall arrange storage of Products to permit access for inspection and periodically inspect to assure Products are undamaged and are maintained under specified conditions.

**PART 2 – PRODUCTS Not Used.**

**PART 3 - EXECUTION Not Used.**

END OF DOCUMENT

## DOCUMENT 01 71 23

**FIELD ENGINEERING****PART 1 - GENERAL****1.01 RELATED DOCUMENTS AND PROVISIONS:**

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Site Investigation, and Soils Investigation Report;
- B. Special Conditions;
- C. Site-Visit Certification.

**1.02 REQUIREMENTS INCLUDED:**

- A. Contractor shall provide and pay for field engineering services by a California-registered engineer, required for the project, including, without limitations:
  - (1) Survey work required in execution of the Project.
  - (2) Civil or other professional engineering services specified, or required to execute Contractor's construction methods.

**1.03 QUALIFICATIONS OF SURVEYOR OR ENGINEERS:**

Contractor shall only use a qualified licensed engineer or registered land surveyor, to whom District makes no objection.

**1.04 SURVEY REFERENCE POINTS:**

- A. Existing basic horizontal and vertical control points for the Project are those designated on the Drawings.
- B. Contractor shall locate and protect control points prior to starting Site Work and preserve all permanent reference points during construction. In addition Contractor shall:
  - (1) Make no changes or relocation without prior written notice to District and Architect.
  - (2) Report to District and Architect when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
  - (3) Require surveyor to replace Project control points based on original survey control that may be lost or destroyed.

**1.05 RECORDS:**

Contractor shall maintain a complete, accurate log of all control and survey work as it progresses.

**1.06 SUBMITTALS:**

- A. Contractor shall submit name and address of Surveyor and Professional Engineer to District and Architect prior to its/their work on the Project.
- B. On request of District and Architect, Contractor shall submit documentation to verify accuracy of field engineering work, at no additional cost to the District.
- C. Contractor shall submit a certificate signed by registered engineer or surveyor certifying that elevations and locations of improvements are in conformance or nonconformance with Contract Documents.

**PART 2 – PRODUCTS Not Used.**

**PART 3 - EXECUTION**

**3.01 COMPLIANCE WITH LAWS:**

Contractor is responsible for meeting all applicable codes, OSHA, safety and shoring requirements.

**3.02 NONCONFORMING WORK:**

Contractor is responsible for any re-surveying required by correction of nonconforming work.

END OF DOCUMENT

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## SECTION 017300 EXECUTION

### PART 1 - GENERAL

#### 1.01 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. Progress cleaning.
  - 6. Starting and adjusting.
  - 7. Protection of installed construction.
  - 8. Correction of the Work.
- B. Related Sections:
  - 1. Division 01 Section "Submittal Procedures" for submitting surveys.
  - 2. Division 01 Section "DSA Quality Control" for testing and inspection procedures.
  - 3. Division 01 Section "Construction Waste Management and Disposal" for waste disposal procedures.

#### 1.02 DEFINITIONS

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

#### 1.03 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certified Surveys: Submit four copies signed by land surveyor.
- C. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

#### 1.04 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified and licensed to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  - 1. Structural Elements: When cutting and patching structural elements, notify Architect, through Construction Manager, of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element 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

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or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

- a. Primary operational systems and equipment.
  - b. Fire separation assemblies.
  - c. Air or smoke barriers.
  - d. Fire-suppression systems.
  - e. Mechanical systems piping and ducts.
  - f. Control systems.
  - g. Communication systems.
  - h. Fire-detection and -alarm systems.
  - i. Conveying systems.
  - j. Electrical wiring systems.
  - k. 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. Exterior curtain-wall construction.
  - d. Sprayed fire-resistive material.
  - e. Equipment supports.
  - f. Piping, ductwork, vessels, and equipment.
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.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

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

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Manager, for the visual and functional performance of in-place materials.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

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

### **3.02 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 caused by differing field conditions outside the control of the Contractor, submit a request for information according to requirements in Division 01 Section "Project Management and Coordination."

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### 3.03 CONSTRUCTION LAYOUT

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

### 3.04 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 Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.
- C. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

### 3.05 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.

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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 (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces and at all means of egress.
- 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 the best possible results. Maintain conditions required for product performance until Substantial Completion.
  - D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
  - E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
  - F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
  - G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
  - H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
    1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
    2. Allow for building movement, including thermal expansion and contraction.
    3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
  - I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
  - J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.06 CUTTING AND PATCHING

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



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- D. Temporary Support: Provide temporary support of work to be cut.
- E. 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.
- F. 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 of Division 01 Section "Summary."
- G. 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 unscheduled interruption to occupied areas.
- H. 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 Division 31 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.
- I. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply

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final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- J. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.07 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- 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.

### 3.08 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
  3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Utilize containers intended for holding waste materials of type to be stored.
  4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  1. Remove liquid spills promptly.
  2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Project Completion.

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- 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 Division 01 Section "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Project 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 assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.09 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "DSA Quality Requirements."

### 3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Project Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.
- C. Limiting Exposures: Supervise construction operations to ensure that no part of the Work, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
  - 1. Excessive static or dynamic loading.
  - 2. Excessive internal or external pressures.
  - 3. Excessively high or low temperatures.
  - 4. Thermal shock.
  - 5. Excessively high or low humidity.
  - 6. Pollution and air contamination.
  - 7. Water or ice.
  - 8. Chemicals and solvents.
  - 9. Light.
  - 10. Radiation.
  - 11. Puncture.
  - 12. Abrasion.
  - 13. Heavy traffic.
  - 14. Soiling, staining, and corrosion.

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15. Bacteria.
16. Rodent and insect infestation.
17. Combustion.
18. Electrical current.
19. High-speed operation.
20. Improper lubrication.
21. Unusual wear or other misuse.
22. Contact between incompatible materials.
23. Destructive testing.
24. Misalignment.
25. Excessive weathering.
26. Unprotected storage.
27. Improper shipping or handling.
28. Theft or vandalism.

### 3.11 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
  1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

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## SECTION 017419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

### PART 1 - GENERAL

#### 1.01 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.

#### 1.02 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

#### 1.03 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of **75**-percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:
  - 1. Demolition Waste:
    - a. Asphalt paving.
    - b. Concrete.
    - c. Concrete reinforcing steel.
    - d. Concrete masonry units.
    - e. Switchgear and panelboards.
    - f. Transformers.
  - 2. Construction Waste:
    - a. Masonry and CMU.
    - b. Lumber.
    - c. Wood sheet materials.
    - d. Wood trim.
    - e. Metals.
    - f. Roofing.
    - g. Insulation.
    - h. Carpet and pad.
    - i. Gypsum board.

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- j. Piping.
- k. Electrical conduit.
- l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
  - 1) Paper.
  - 2) Cardboard.
  - 3) Boxes.
  - 4) Plastic sheet and film.
  - 5) Polystyrene packaging.
  - 6) Wood crates.
  - 7) Plastic pails.

#### 1.04 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 30 days of date established for the Notice to Proceed.

#### 1.05 INFORMATIONAL SUBMITTALS

- A. 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.
- B. 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.
- C. 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.

#### 1.06 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

#### 1.07 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and 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.

### PART 2 - PRODUCTS (NOT USED)

### PART 3 - EXECUTION

#### 3.01 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

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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, recycled, reused, donated, and sold.
  2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

### 3.02 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall be shared equally by Owner and Contractor.
- C. 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.
- D. 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.

### 3.03 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch (38-mm) size.
- B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  1. Pulverize concrete to maximum 1-1/2-inch (38-mm) size.

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2. Crush concrete and screen to comply with requirements in Section 312000 "Earth Moving" for use as satisfactory soil for fill or subbase.

### 3.04 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.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

### 3.05 DISPOSAL OF WASTE

#### A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

#### B. Burning: Do not burn waste materials.

#### C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

### 3.06 ATTACHMENTS

- A. Form CWM-1 for construction waste identification.
- B. Form CWM-2 for demolition waste identification.

### END OF SECTION 017419



FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION							
MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED*	EST. WASTE (%)	TOTAL EST. QUANTITY OF WASTE*	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
		(A)	(B)	(C = A x B)			
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							
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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## SECTION 017800 CLOSEOUT SUBMITTALS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

#### 1.02 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Individual Product Sections: Specific requirements for operation and maintenance data.
- C. Individual Product Sections: Warranties required for specific products or Work.

#### 1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
  - 1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
  - 2. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
  - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

### PART 2 PRODUCTS - NOT USED

### PART 3 EXECUTION

#### 3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Addenda.
  - 3. Change Orders and other modifications to the Contract.
  - 4. Reviewed shop drawings, product data, and samples.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.

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- E. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
  - 1. Measured depths of foundations in relation to finish first floor datum.
  - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

### 3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

### 3.03 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
  - 1. Description of unit or system, and component parts.
  - 2. Identify function, normal operating characteristics, and limiting conditions.
  - 3. Include performance curves, with engineering data and tests.
  - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- E. Provide servicing and lubrication schedule, and list of lubricants required.
- F. Include manufacturer's printed operation and maintenance instructions.
- G. Include sequence of operation by controls manufacturer.
- H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- I. Additional Requirements: As specified in individual product specification sections.

### 3.04 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.

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- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.
- F. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.
- G. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

**END OF SECTION**

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## SECTION 017823 OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems, and equipment.
  - 4. Product maintenance manuals.
  - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
  - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

#### 1.02 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.

#### 1.03 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed 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 operations and maintenance submittals are acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
  - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
    - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    - b. Enable inserted reviewer comments on draft submittals.
  - 2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect, through Construction Manager, will return two copies.
- C. 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.

### PART 2 - PRODUCTS

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## 2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
  - 1. List of documents.
  - 2. List of systems.
  - 3. List of equipment.
  - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. 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.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- 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."

## 2.02 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: 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

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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. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
  - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  - 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- F. 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 (215-by-280-mm) 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, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
  - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  - 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
  - 4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) 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.

## 2.03 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:

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1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- B. 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.
- C. 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.
- D. 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.

#### 2.04 OPERATION MANUALS

- A. 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.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
  2. Manufacturer's name.



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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.
- C. 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.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## 2.05 PRODUCT MAINTENANCE MANUALS

- A. 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.
- B. 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.
- C. 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.
- D. 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.

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4. Schedule for routine cleaning and maintenance.
5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. 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.

## 2.06 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. 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 warranty and bond information, as described below.
- B. 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.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  1. Standard maintenance instructions and bulletins.
  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.
- D. 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.
- E. 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.
- F. 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.

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- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. 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 3 - EXECUTION**

### **3.01 MANUAL PREPARATION**

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. 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.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  - 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.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original project record documents as part of operation and maintenance manuals.
  - 2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."
- G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

### **END OF SECTION 017823**

## DOCUMENT 01 78 36

**WARRANTIES****PART 1 - GENERAL****1.01 RELATED DOCUMENTS AND PROVISIONS**

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Warranty/Guarantee Information;
- B. Special Conditions.

**1.02 FORMAT**

- A. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size.
- B. Cover: Contractor shall identify each binder with typed or printed title "WARRANTIES" and shall list title of Project.
- C. Table of Contents: Contractor shall provide title of Project; name, address, and telephone number of Contractor and equipment supplier; and name of responsible principal. Contractor shall identify each item with the number and title of the specific Specification, document, provision, or section in which the name of the product or work item is specified.
- D. Contractor shall separate each warranty with index tab sheets keyed to the Table of Contents listing, providing full information and using separate typed sheets as necessary. Contractor shall list each applicable and/or responsible Subcontractor(s), supplier(s), and/or manufacturer(s), with name, address, and telephone number of each responsible principal(s).

**1.03 PREPARATION:**

- A. Contractor shall obtain warranties, executed in duplicate by each applicable and/or responsible subcontractor(s), supplier(s), and manufacturer(s), within ten (10) days after completion of the applicable item or work. Except for items put into use with District's permission, Contractor shall leave date of beginning of time of warranty blank until the date of completion is determined.
- B. Contractor shall verify that documents are in proper form, contain full information, and are notarized, when required.
- C. Contractor shall co-execute submittals when required.
- D. Contractor shall retain warranties until time specified for submittal.

**1.04 TIME OF SUBMITTALS:**

- A. For equipment or component parts of equipment put into service during construction with District's permission, Contractor shall submit a draft warranty for that equipment or component within ten (10) days after acceptance of that equipment or component.
- B. Contractor shall submit for District approval all warranties and related documents within ten (10) days after date of completion. Contractor must revise the warranties as required by the District prior to District's approval of Contractor's final Application for Payment.
- C. For items of work delayed beyond date of completion, Contractor shall provide an updated submittal within ten (10) days after acceptance, listing the date of acceptance as start of warranty period.

**PART 2 - PRODUCTS Not Used.**

**PART 3 – EXECUTION Not Used.**

END OF DOCUMENT

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## SECTION 017839 PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
  - 1. Record Drawings:
    - a. Marked-Up Record Prints.
    - b. Scanned PDF Electronic Files of Marked-Up Record Prints.
  - 2. Record Specifications.
  - 3. Record Contract Modification Documents.
- B. Related Sections:
  - 1. Division 01 Section "Submittal Procedures" for general submittal procedures and for definition of PDF electronic file format.
  - 2. Division 01 Section "Closeout Procedures" for general closeout procedures.
  - 3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 4. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

#### 1.02 CLOSEOUT SUBMITTALS

- A. Record Drawings. Comply with the following:
  - 1. Marked-Up Record Prints. Submit paper copies of record Drawings as follows:
    - a. Initial Submittal: Submit one paper set of marked-up record prints. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal: Make all corrections, changes and additions from marked-up record prints. Submit one paper set of final marked-up record prints.
  - 2. Scanned PDF Electronic Files of Marked-Up Record Prints. Submit electronic copies of record Drawings as follows:
    - a. Final Submittal: Submit three scanned PDF electronic file copies of final marked-up record prints.
- B. Record Specifications (Project Manual): Submit copies of final project specifications as follows:
  - 1. Initial Submittal: Submit one paper set of updated project specifications. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
  - 2. Final Submittal: Make all corrections, changes and additions from marked-up specifications. Submit one paper set and three scanned PDF electronic file copies of final marked-up specifications.
- C. Record Contract Modification Documents: Submit copies of all contract modification documents relating to the physical work, including Addenda, Construction Change Directives, RFI's, ASI's and other contract modifications as follows:
  - 1. Initial Submittal: Submit one paper set of marked-up contract modification documents. Architect will indicate whether general scope of changes, additional information

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recorded, and quality of drafting are acceptable.

2. Final Submittal: Make all corrections, changes and additions from marked-up contract modification documents. Submit one paper set and three scanned PDF electronic file copies of final marked-up specifications.
- D. Monthly Reviews: Review job-site copy of record marked-up prints concurrent with submittal of application for payment. Demonstrate that change items are incorporated in Project record documents concurrent with progress of the Work, including modifications, RFI's, ASI's, CCD's, concealed conditions, field changes, product selections, and other notations.

## **PART 2 - PRODUCTS**

### **2.01 RECORD DRAWINGS**

- A. Marked-Up Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings as follows:
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 archive 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 below first floor.
    - 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, including RFI's and ASI's.
    - 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. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
  4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

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5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, RFI numbers, ASI numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
7. Prepare a full set of corrected marked-up record prints of the Contract Drawings after conducting a final review of the marked-up record prints with Architect and Construction Manager:
  - a. Conduct the final review immediately before inspection for Preliminary Completion.
- B. Record Digital Data Files: After final review and preparation of the marked-up record prints and when authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
  1. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable. Refer instances of uncertainty to Architect, through Construction Manager for resolution
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location (lower right hand corner of sheet):
  1. Marked-Up Record Prints: Organize record prints and newly prepared record Drawings 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. Scanned PDF Electronic Files of Marked-Up Record Prints: Organize scanned PDF electronic copies of record Drawings into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include sheet identification within each file.
    - a. Media: Provide electronic files on DVD ROM media, in UDF version 1.02 disk format. Provided clearly labeled jewel cases.
  4. Identification: Provide the following designation on each sheet or file of the Record Drawings:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect and Construction Manager.
    - e. Name of Contractor.

## 2.02 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications and as follows:
  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.



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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 addenda, Construction Change Directives, RFI's, ASI's, Change Orders and other contract modifications, and Record Drawings where applicable.
- B. Format:
1. Paper: Bind paper copies in three-ring binders, each identified according to document type. Include record Specification directory organized by specification section number and title.
  2. Electronic Media: Organize PDF files by types within directories and identify each file by name. Provide electronic files on DVD ROM media, in UDF version 1.02 disk format. Provided clearly labeled jewel cases.

## 2.03 RECORD CONTRACT MODIFICATIONS

- A. Preparation: Assemble Addenda, Construction Change Directives, RFI's, ASI's and other contract modification documents relating to the physical work. Include all pertinent attachments, including associated Record Drawings and Record Specifications where applicable, and bind.
1. Record Drawings: Full-size drawings issued as part of contract modifications may be incorporated into the Record Drawing set, if cross-referencing is clearly provided between the contract modification document and the Record Drawing and between the Record Drawing and the issuing document.
  2. Record Specifications: Specifications issued as part of contract modifications may be incorporated into the Record Specification set, if cross-referencing is clearly provided between the contract modification document and the Record Specification and between the Record Specification and the issuing document.
- B. Mark Record Drawings and Record Specifications to indicate the appropriate contract modification of the physical work.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Provide a complete record of all products installed, and the details and locations of the installation. Include proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected, or cross reference to the modification document.
  3. Note related Addenda, Construction Change Directives, RFI's, ASI's, Change Orders and other contract modifications, on Record Drawings and Specifications where applicable.
- C. Format:
1. Paper: Bind paper copies in three-ring binders, each identified according to document type. Include all attachments smaller than the size of the Drawings. Include a Record Contract Modification directory organized by number and title.
  2. Electronic Media: Organize PDF files by types within directories and identify each file by name. Provide electronic files on DVD ROM media, in UDF version 1.02 disk format. Provided clearly labeled jewel cases.

## PART 3 - EXECUTION

### 3.01 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as

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they occur; do not wait until the end of Project.

- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for reference during normal working hours.

**END OF SECTION 017839.00**

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## SECTION 017900 DEMONSTRATION AND TRAINING

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.

#### 1.02 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.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.

#### 1.03 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.

### PART 2 - PRODUCTS

#### 2.01 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.

### PART 3 - EXECUTION

#### 3.01 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 017823 "Operation and Maintenance Data."

#### 3.02 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- 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, through Construction Manager, with at least seven days' advance notice.

**END OF SECTION 017900**

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## SECTION 019113 GENERAL COMMISSIONING REQUIREMENTS

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
  - 1. Verify that the work is installed in accordance with the Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
  - 2. Verify and document that functional performance is in accordance with the Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
  - 3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
  - 4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.
- B. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

#### 1.02 RELATED REQUIREMENTS

- A. Section 017800 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

### PART 2 PRODUCTS

#### 2.01 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
  - 1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F (0.3 degree C) and resolution of plus/minus 0.1 degree F (0.05 degree C).
  - 2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
  - 3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.
- C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.
- D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.

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1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Owner.

## **PART 3 EXECUTION**

### **3.01 COMMISSIONING PLAN**

- A. Commissioning Authority has prepared the Commissioning Plan.
  1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
  2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.
- B. Contractor is responsible for compliance with the Commissioning Plan.
- C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.
- D. Commissioning Schedule:
  1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
  2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
  3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
  4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

### **3.02 STARTUP PLANS AND REPORTS**

- A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.
- B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.
- C. Submit directly to the Commissioning Authority.

### **3.03 PREFUNCTIONAL CHECKLISTS**

- A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
  1. No sampling of identical or near-identical items is allowed.
  2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
  3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
    - a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
    - b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
    - c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
    - d. Serial number of installed unit.

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- e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer's start-up checklist items and minor testing.
  - f. Sensor and actuator calibration information.
- B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
  - 1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
  - 2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
  - 3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
  - 4. If any Checklist line item is not relevant, record reasons on the form.
  - 5. Contractor may independently perform startup inspections and/or tests, at his option.
  - 6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
  - 7. Submit completed Checklists to Commissioning Authority within two days of completion.
- C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
  - 1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in the Contract Documents.
  - 2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
  - 3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in the Contract Documents or not.
  - 4. When asked to review the proposed Checklists, do so in a timely manner.
- D. Commissioning Authority Witnessing: Required for:
  - 1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
  - 2. A sampling of non-primary equipment, as allowed by the commissioning plan.
- E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
  - 1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

### 3.04 FUNCTIONAL TESTS

- A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is

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allowed by the final test procedures.

- B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.
- C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.
- D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
  - 1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents or does not perform properly.
  - 2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.
  - 3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
  - 4. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing.
  - 5. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.
- E. Functional Test Procedures:
  - 1. Some test procedures are included in the Contract Documents; where Functional Test procedures are not included in the Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
  - 2. Examples of Functional Testing:
    - a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
    - b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
    - c. Systems are run through all the HVAC control system's sequences of operation and components are verified to be responding as the sequence's state.
    - d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.

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- F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

### 3.05 SENSOR AND ACTUATOR CALIBRATION

- A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gages, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.
- B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.
- C. All Sensors:
1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
  2. Verify that sensors with shielded cable are grounded only at one end.
  3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F (0.1 degree C) of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
  4. Tolerances for critical applications may be tighter.
- D. Sensors Without Transmitters - Standard Application:
1. Make a reading with a calibrated test instrument within 6 inches (150 mm) of the site sensor.
  2. Verify that the sensor reading, via the permanent thermostat, gage or building automation system, is within the tolerances in the table below of the instrument-measured value.
  3. If not, install offset, calibrate or replace sensor.
- E. Sensors With Transmitters - Standard Application.
1. Disconnect sensor.
  2. Connect a signal generator in place of sensor.
  3. Connect ammeter in series between transmitter and building automation system control panel.
  4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
  5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
  6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
  7. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
  8. Reconnect sensor.
  9. Make a reading with a calibrated test instrument within 6 inches (150 mm) of the site sensor.



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10. Verify that the sensor reading, via the permanent thermostat, gage or building automation system, is within the tolerances in the table below of the instrument-measured value.
11. If not, replace sensor and repeat.
12. For pressure sensors, perform a similar process with a suitable signal generator.
- F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
  1. Watthour, Voltage, Amperage: 1 percent of design.
  2. Pressure, Air, Water, Gas: 3 percent of design.
  3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F (0.2 degree C).
  4. Relative Humidity: 4 percent of design.
  5. Barometric Pressure: 0.1 inch of Hg (340 Pa).
  6. Flow Rate, Air: 10 percent of design.
  7. Flow Rate, Water: 4 percent of design.
  8. AHU Wet Bulb and Dew Point: 2.0 degrees F (1.1 degrees C).
- G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.
- H. Valve/Damper Stroke Setup and Check:
  1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
  2. Set pump/fan to normal operating mode.
  3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
  4. Command valve/damper to open; verify position is full open and adjust output signal as required.
  5. Command valve/damper to a few intermediate positions.
  6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
  1. With full pressure in the system, command valve closed.
  2. Use an ultra-sonic flow meter to detect flow or leakage.

### 3.06 TEST PROCEDURES - GENERAL

- A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
- B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.
- C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
  1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
  2. Sampling is not allowed for:

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- a. Major equipment.
  - b. Life-safety-critical equipment.
  - c. Prefunctional Checklist execution.
3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
7. If YY percent of the units in the second sample fail, test all remaining identical units.
8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.
- D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").
- E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.
- F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.
- G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.
- H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.
- I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
  1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
  2. Other points will be monitored by the Commissioning Authority using dataloggers.
  3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.
  4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
  5. Graphical output is desirable and is required for all output if the system can produce it.
  6. Monitoring may be used to augment manual testing.

### 3.07 OPERATION AND MAINTENANCE MANUALS

- A. See Section 017800 - Closeout Submittals for additional requirements.

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- B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

**END OF SECTION**

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## **SECTION 024100 DEMOLITION**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Building demolition .
- B. Abandonment and removal of existing utilities and utility structures.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- D. Section 312323 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

### **PART 3 EXECUTION**

#### **2.01 GENERAL PROCEDURES AND PROJECT CONDITIONS**

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain required permits.
  - 2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
  - 3. Provide, erect, and maintain temporary barriers and security devices.
  - 4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  - 5. Do not close or obstruct roadways or sidewalks without permit.
  - 6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
  - 7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Protect existing structures and other elements that are not to be removed.
  - 1. Provide bracing and shoring.
  - 2. Prevent movement or settlement of adjacent structures.
  - 3. Stop work immediately if adjacent structures appear to be in danger.

#### **2.02 EXISTING UTILITIES**

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.

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- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

### 2.03 EXISTING TREE REMOVAL

- A. Existing trees marked for removal with a DBH of 14" and larger shall be offhauled to a designated Reclaimed Lumber Mill for reuse onsite.
  - 1. Logs measuring a min caliper of 14" dia. shall be debranched, cut to a min of 10' long and loaded on a truck at max capacity to be hauled to the following address at the expense of the General Contractor:
    - a. Urban Wood Rescue
    - b. 6045 Midway St, Sacramento, CA 95828
    - c. Contact: Jennifer Szeliga
    - d. Direct: 916-974-4325
    - e. Email: Jennifer@sactree.com
- B. The delivery(s) shall contain enough logs for a min of 4,800 linear board feet.
  - 1. There is no additional charge for excess clean log delivery, the excess will be donated to Urban wood rescue, so all loads shall be full.
- C. The General Contractor is responsible for obtaining the contract with Urban Wood Rescue to prepare the lumber for reuse
  - 1. The General Contractor shall allow eight (8x) weeks min. for the logs to be milled into lumber and kiln dried to a min of 12% moisture condition.
  - 2. The General Contractor shall be responsible for picking up the kiln dried lumber and delivering back to the site.
- D. The General Contractor Shall assemble 32 picnic tables with the reclaimed lumber per the detail provided in the landscape construction drawings.

### 2.04 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

### END OF SECTION

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## SECTION 031000 CONCRETE FORMING AND ACCESSORIES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Form stripping.

#### 1.02 RELATED REQUIREMENTS

- A. Section 032000 - Concrete Reinforcing.

#### 1.03 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014.
- B. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).
- C. ACI 301 - Specifications for Structural Concrete 2016.
- D. ACI 347R - Guide to Formwork for Concrete 2014, with Errata (2017).

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.

### PART 2 PRODUCTS

#### 2.01 FORMWORK - GENERAL

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.
- C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

### PART 3 EXECUTION

#### 3.01 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

#### 3.02 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

**END OF SECTION**

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## SECTION 032000 CONCRETE REINFORCING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Reinforcing steel for cast-in-place concrete.

#### 1.02 RELATED REQUIREMENTS

- A. Section 031000 - Concrete Forming and Accessories.

#### 1.03 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete 2016.
- B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).
- C. ACI SP-66 - ACI Detailing Manual 2004.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2018.
- E. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement 2018.
- F. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel 2018.
- G. CRSI (DA4) - Manual of Standard Practice 2009.
- H. CRSI (P1) - Placing Reinforcing Bars 2011.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

### PART 2 PRODUCTS

#### 2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).

#### 2.02 RE-BAR SPLICING:

- A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.
- B. Dowel Bar Splicer with Dowel-Ins: Mechanical devices for connecting dowels; capable of developing full steel reinforcing design strength in tension and compression.

#### 2.03 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

### PART 3 EXECUTION

#### 3.01 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

**END OF SECTION**

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## SECTION 055000 METAL FABRICATIONS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Shop fabricated steel items.

#### 1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 055213 - Pipe and Tube Railings.

#### 1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2018.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.
- E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2014.
- F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015, with Errata (2016).
- H. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel 2017.
- I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
  - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.
- D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

### PART 2 PRODUCTS

#### 2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.



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- E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- F. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

## 2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

## 2.03 FINISHES - STEEL

- A. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

## 2.04 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).
- C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).
- D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).
- E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

# PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

## 3.02 PREPARATION

- A. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

## 3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components as indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.

**END OF SECTION**

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## SECTION 055213 PIPE AND TUBE RAILINGS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Stair railings and guardrails.
- B. Free-standing railings at steps.

#### 1.02 RELATED REQUIREMENTS

- A. Section 099113 - Exterior Painting: Paint finish.
- B. Section 321313 - Concrete Paving

#### 1.03 REFERENCE STANDARDS

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2018.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- C. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings 2000 (Reapproved 2006).
- D. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).

#### 1.04 QUALITY ASSURANCE

- A. Railings and handrails: CBC Section 11B-505:
  - 1. Top of gripping surfaces of handrails shall be 34 inches minimum and 38 inches maximum vertically above walking surfaces, stair nosings, and ramp surfaces. Handrails shall be at a consistent height above such surfaces.
  - 2. Clearance between handrail gripping surfaces and adjacent surfaces shall be 1-1/2 inches minimum. Handrail may be located in a recess if the recess is 3 inches maximum deep and 18 inches minimum clear above the top of the handrail.
  - 3. Handrail gripping surfaces shall be continuous along their length and shall not be obstructed along their tops or sides. The bottoms of handrail gripping surfaces shall not be obstructed for more than 20 percent of their length. Where provided, horizontal projections shall occur 1-1/2 inches minimum below the bottom of the handrail gripping surfaces.
  - 4. Handrail gripping surfaces with a circular cross section shall have an outside diameter of 1-1/4 inches minimum and 2 inches maximum.
  - 5. Handrail gripping surfaces with a non-circular cross section shall have an outside dimension of 4 inches minimum and 6-1/4 inches maximum, and a cross-sectional dimension of 2-1/4 inches maximum.
  - 6. Handrail gripping surfaces and any surfaces adjacent to them shall be free of sharp or abrasive elements and shall have rounded edges.
  - 7. Handrails shall not rotate within their fittings.
  - 8. Handrail gripping surfaces shall extend beyond and in the same direction of stair flights and ramp runs in accordance with CBC Section 11B-505.10. Such extensions are not required for continuous handrails at the inside turn of switchback or dogleg stairs and ramps.
  - 9. A 2 inch minimum high curb or a barrier shall be provided to prevent the passage of a 4 inch diameter sphere rolling off the sides of a ramp surface. Such a curb or barrier

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shall be continuous and uninterrupted along the entire length of a ramp. CBC Section 11B-405.9.2.

## PART 2 PRODUCTS

### 2.01 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
- B. Allow for expansion and contraction of members and building movement without damage to connections or members.
- C. Dimensions: See drawings for configurations and heights.
- D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
- E. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.
- F. Top of gripping surfaces of handrails shall be 34" minimum and 38" maximum vertically above walking surfaces, stair nosings, and ramp surfaces. Handrails shall be at a consistent height above such surfaces.
- G. Clearance between handrail gripping surfaces and adjacent surfaces shall be 1-1/2" minimum. Handrail may be located in a recess if the recess is 3" maximum deep and 18" minimum clear above the top of the handrail.
- H. Handrail gripping surfaces shall be continuous along their length and shall not be obstructed along their tops or sides. The bottoms of handrail gripping surfaces shall not be obstructed for more than 20% of their length. Where provided, horizontal projections shall occur 1-1/2" minimum below the bottom of the handrail gripping surfaces.
- I. Handrail gripping surfaces with a circular cross section shall have an outside diameter of 1-1/4" minimum and 2" maximum.
- J. Handrail gripping surfaces with a non-circular cross section shall have an outside dimension of 4" minimum and 6-1/4" maximum, and a cross-sectional dimension of 2-1/4" maximum.
- K. Handrail gripping surfaces and any surfaces adjacent to them shall be free of sharp or abrasive elements and shall have rounded edges.
- L. Handrails shall not rotate within their fittings.
- M. Handrail gripping surfaces shall extend beyond and in the same direction of stair flights and ramp runs in accordance with **CBC Section 11B-505.10**. Such extensions are not required for continuous handrails at the inside turn of switchback or dogleg stairs and ramps.
- N. A 2" minimum high curb or a barrier shall be provided to prevent the passage of a 4" diameter sphere rolling off the sides of a ramp surface. Such a curb or a barrier shall be continuous and uninterrupted along the length of a ramp. **CBC Section 11B-405.9.2**.

### 2.02 STEEL RAILING SYSTEM

- A. Steel Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.
- B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- C. Exposed Fasteners: No exposed bolts or screws.
- D. Galvanizing: In accordance with requirements of ASTM A123/A123M.

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- E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

## 2.03 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
  - 1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
  - 2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
  - 3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Anchor railings securely to structure.

### 3.02 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

**END OF SECTION**

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**SECTION 099620**  
**PERMANENT NON-SACRIFICIAL ANTI-GRAFFITI COATING**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Anti-graffiti coating systems vertical surfaces for cast-in-place site concrete.
- B. Surface preparation
- C. field application

**1.02 RELATED SECTIONS INCLUDE THE FOLLOWING:**

- A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 323300 - Architectural Site Concrete

**1.03 REGULATORY REQUIREMENTS**

- A. California Air Resources Board, Volatile Organic Compound (VOC) Limitation: Provide anti-graffiti coating materials, including primers, undercoats, and finish-coat materials, that have a VOC content of 100 g/l or less, consistent with Southern California Air Quality Management District (SCAQMD) Rule 1113 for architectural flat coatings.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating coating materials and mock-up location for Cast-in-place site walls.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Maintenance Data: Include cleaning procedures and repair and patching techniques.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Coating Materials: 1 gallon (4 liters) of each type and color.
  - 2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

**1.05 QUALITY ASSURANCE**

- A. Maintain one copy of each referenced document that applies to application on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 8 years documented experience.

**1.06 MOCK-UP**

- A. Apply Sealer and Anti-graffiti coating to approved Architectural Site Concrete Mock-ups for review and approval by Architect and client prior to beginning work.
- B. Locate where directed.
- C. Mock-up may not remain as part of the Work.

**1.07 WARRANTY**

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within one year period after Date of Substantial Completion.

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- C. Warranty: Include coverage for bond to substrate.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Basis-of-Design Products: The design for each non-sacrificial anti-graffiti coating system is based on the products indicated.
- B. Type 2, Silane/Siloxane-Based Systems:
  - 1. Rainguard International Inc., VandIGuardTEN non-sacrificial Anti-Graffiti System.
    - a. Sealer; Product Micro-Seal Water Repellant.
    - b. Non-Sacrificial Coating; Product VandIGuardTEN
    - c. Finish Coat; Product VandIGuard Finish Coat.

### **2.02 PERFORMANCE REQUIREMENTS**

- A. General: Non-sacrificial anti-graffiti coating system with the following properties:
  - 1. Superior protection against, and easy removal of, unwanted graffiti.
  - 2. Minimum alteration of appearance of treated surface when compared to untreated surface, including gloss and color.
  - 3. Minimum alteration of water vapor transmission rate through complete wall system.
    - a. Coating system shall have a minimum water vapor transmission rate of 95 percent when tested per ASTM D1653.
- B. Completed coating system performance shall comply with ASTM D 6578 "Standard Practice for Determination of Graffiti Resistance," and the following:
  - 1. Cleanability Level 3: Achieve Level 3 cleaning performance, removing all test graffiti items using citrus-based cleaners or milder solvents.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates and conditions under which anti-graffiti coatings will be applied, for compliance with coating application requirements.
- B. Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry.

### **3.02 PREPARATION**

- A. General: Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item; provide surface-applied protection before surface preparation and coating.
  - 1. After completing coating operations, reinstall items that were removed, using workers skilled in the trades involved.
- B. Surface Preparation: Clean and prepare surfaces to be coated according to manufacturer's written instructions for each substrate condition and as specified.
  - 1. Prepare concrete to be coated. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods to prepare surfaces.
  - 2. Surfaces to receive sealer shall be cleaned of dirt, oil, graffiti, grease, laitance, and other contaminants.
  - 3. Mid-pressure water (1500 psi) washing is the minimum cleaning that will be accepted, other methods, such as abrasive blasting and power may be submitted for review.

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4. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
- C. Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.
  1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
  2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application.
  3. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
  4. Use only the type of thinners approved by manufacturer and only within recommended limits.
- D. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of coating system components. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of components being deposited on surfaces. Cover live plants and grass.
- E. Coordination with Sealants: Do not apply anti-graffiti coatings until sealants for joints adjacent to surfaces receiving coatings have been installed and cured.
  1. Anti-graffiti coating work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, anti-graffiti coatings, and sealant materials identical to those used in the work.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.03 APPLICATION

- A. General: Apply anti-graffiti coatings according to manufacturer's written instructions.
  1. Use applicators and techniques best suited for the material being applied.
  2. Do not apply anti-graffiti coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
  3. Coating surface treatments and finishes are indicated in the coating system descriptions.
  4. Provide finish coats compatible with primers used.
  5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, drinking fountains, grilles, covers for electrical equipment, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
- B. Coat surfaces behind movable equipment and furniture the same as similar exposed surfaces.
  1. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
- C. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
- D. The number of coats and film thickness required is the same regardless of application method.
  1. Micro-Seal- one (1) coat
  2. VandlGuard TEN- two (2) coats

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3. VandlGuard Finish Coat- one (1) coat
  - E. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. Allow sufficient time between successive coats to permit proper drying.
  - F. Give special attention to edges, corners, crevices, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.
  - G. Application Procedures: Apply coatings according to manufacturer's written instructions.
    1. Spray Equipment: Use spray equipment with pressure and orifice size recommended by manufacturer for material and texture required.
  - H. Minimum Coating Thickness: Apply each material no thinner than manufacturers recommended spreading rate.
    1. Provide total dry film thickness of the entire system as recommended by manufacturer.
  - I. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by manufacturer, to material required to be coated or finished that has not been prime coated by others.
  - J. Recoat primed and sealed substrates immediately if there is evidence of suction spots or unsealed areas in first coat, to ensure a finish coat with no burn-through or other defects caused by insufficient sealing.
  - K. Completed Work: Match accepted mockups for shade and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

#### 3.04 FIELD QUALITY CONTROL

- A. Provide the services of the manufacturer's authorized field representative to verify that installed products comply with manufacturer's requirements and with the standard established by the Architect approved mockup/test panels.
- B. Remove and replace work where test results indicate that it does not comply with specified requirements.

#### 3.05 CLEANING

- A. Immediately clean anti-graffiti coatings from adjoining surfaces and surfaces soiled or damaged by application as work progresses. Repair damage caused by application. Comply with manufacturer's written cleaning instructions.
- B. Clean up debris and unused material and remove from site.

#### 3.06 PROTECTION

- A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

#### END OF SECTION



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## SECTION 230923 ENERGY MANAGEMENT SYSTEM FOR HVAC (EMS)

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes equipment and performance criteria for furnishing all labor and materials for the installation and programming for Energy Management System for HVAC Systems utilizing wireless communication with cloud based servers.

#### 1.02 RELATED SECTIONS:

- A. Division 01: General Requirements
- B. Section 23: Heating, Ventilating, and Air-Conditioning (HVAC)

#### 1.03 SUBMITTALS:

- A. Shop Drawings and product data in accordance with the specifications.
- B. All shop drawings shall be prepared in AutoCAD 2000 or newer. In addition, Contractor shall provide drawings in electronic format with x-ref and layer information to other trades as required.
- C. All submittals shall be bound or in a three ring binder with a table of contents and related section tabs. Five (5) copies shall be submitted to the Architect or engineer for distribution and review.
- D. Shop drawings shall include basic floor plans depicting locations of all equipment and wiring, installed by others, to be controlled by system and locations of thermostats, gateways and other equipment provided under this section. Drawings shall also show location of electrical power, low voltage wiring and data ports, provided by others, required for proper installation of systems of this section.
- E. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification.
- F. Submit five (5) copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor prior to submitting shall check all documents for accuracy.
- G. The Engineer will make corrections, if required, and return to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

#### 1.04 SCOPE OF WORK

- A. Except as otherwise noted, the control system shall consist of all thermostats, and gateways to fill the intent of the specification and provide for a complete and operable system.
- B. The EMS contractor shall review and study existing building/site conditions where applicable and all new construction drawings for the project including HVAC drawings and the entire project specifications to familiarize themselves with the equipment and system operation prior to bidding and submittal of a bid/price and notify the owner immediately of any conflicts between the project and the scope of work of this section, including work to be completed by others.
- C. All equipment and installation of control devices associated with the equipment listed below shall be provided under this Contractor.
- D. When the EMS system is fully installed and operational, the EMS Contractor will make themselves available to meet with the designated representatives of the owner to review the

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as-installed condition of the system. At that time, the EMS contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications.

- E. The Contractor shall furnish and install a complete EMS control system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification. Provide and Install EMS controls for the HVAC Equipment as noted on the drawings:
- F. Provide technical support necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor and the owner's team.
- G. Contractor shall provide one training session in the operation of the system, for owner's personnel.
- H. All work performed under this section of the specifications will be in compliance with all codes and regulations as mandated by the authority having jurisdiction.

#### 1.05 SYSTEM DESCRIPTION

- A. The Energy Management System (EMS) shall consist of thermostats, gateways and related accessories as indicated below and all related programming for a complete and fully operational web based management system using a cloud server program complying with the following specifications.
- B. The entire Energy Management Solution (EMS) shall include a network of commercial Internet programmable thermostats which use IEEE 802.15.4 mesh wireless communication protocol to reach a Wireless Gateway (WG). The WG must connect to the owner's wide area network (WAN) over a TCP/IP connection. Access and control of EMS is through a web based management tool which sits on a cloud server and must be accessible either locally or remotely via the Internet.

#### 1.06 WORK BY OTHERS

- A. The EMS Contractor shall coordinate with other contractors prior to performing the work on this project and cooperate as necessary to achieve a complete and neat installation. To that end, each contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others' work prior to fabrication and installation. The owner's representative shall be immediately notified if an area of conflict occurs between trades prior to fabrication and installation. EMS Contractor shall provide field supervision to the Mechanical Contractor for pre-installation of control components.
- B. Low voltage thermostat wiring between equipment and thermostat locations shall be furnished and installed by others. Unless noted otherwise all new low voltage wiring shall be multiple conductor thermostat wiring (wire count as indicated in Thermostat Manufacturer's installation instructions) installed per owner's specifications. (Wiring in existing installations shall be minimum 3 conductor / 24 gauge wires per EMS manufacturer's standard specifications, multiple c conductor/24 gauge thermostat wiring preferred - see Installation Instructions for specific conductor counts depending on heating and cooling modes of existing equipment.)
- C. Related work provided by others:
  - 1. 110 V outlets shall be provided within 5 feet of each gateway location.
  - 2. 1 Data port shall be provided within 10 feet of each gateway location.
- D. Equipment start-up and servicing

#### 1.07 CODE COMPLIANCE

- A. Provide EMS components and ancillary equipment which are code compliant.
- B. All wiring shall conform to the National Electrical Code.

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- C. All products of the EMS shall reside with the following agency approvals.
1. California 2016 Title 24 Compliant.
  2. California Energy Commission Occupant Control Smart Thermostat (OCST) certified.
  3. OpenADR2.0 certified.

#### 1.08 **SYSTEM STARTUP & COMMISSIONING**

- A. Each EMS component in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the EMS will be tested against the appropriate sequence of operation specified herein. Successful completion of the system test shall constitute the beginning of the warranty period. A written report will be submitted to the owner indicating that the installed system functions in accordance with the plans and specifications.
- B. The EMS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The EMS Contractor shall have a trained technician available on request during the balancing of the systems. The EMS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract to assist with functional testing of system as it relates to EMS.

#### 1.09 **TRAINING**

- A. The EMS Contractor shall provide training for two (2) owner's representatives and/or maintenance personnel. The EMS Contractor shall provide on-site training to the District's representative(s) and maintenance personnel per the following description:
- B. On-site training shall consist of a minimum of (1) hours, as indicated above of hands-on instruction geared at the operation and maintenance of the systems. The curriculum shall include
1. System Overview
  2. System Software and Operation
  3. System access
  4. Software features overview
  5. Changing set points and other attributes
  6. Scheduling
  7. Editing programmed variables
  8. Displaying color graphics
  9. Running reports
  10. Workstation maintenance
  11. Application programming
  12. Operational sequences including start-up, shutdown, adjusting and balancing.
  13. Equipment maintenance

#### 1.10 **OPERATING AND MAINTENANCE MANUALS**

- A. The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the entire EMS. This documentation shall include specific part numbers.
- B. Following project completion and testing, the EMS contractor will submit as-built documentation reflecting the exact installation of the system.

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## 1.11 WARRANTY

- A. The EMS contractor shall warrant the system for 12 months after system acceptance and beneficial use by the District. During the warranty period, the EMS contractor shall be responsible for all necessary revisions to the software as required to provide a complete and workable system consistent with the letter and intent of the Sequence of Operation section of the specification. EMS equipment shall be warranted for a period of 5 years from the time of system acceptance.
- B. Warranty of equipment is limited to replacement of defective products.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Unless noted otherwise, all products shall be of a single manufacturer. The standard of design and quality shall be products as manufactured by Pelican Wireless Systems,
- B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional requirements of the specified product. A request for Architect/Engineer's approval must be submitted with complete technical data to allow for proper evaluation. All materials for evaluation must be received by Project Manager at least 10 days prior to bid due date.

### 2.02 WIRELESS GATEWAY (WG)

- A. A single WG shall be capable of providing communication between a dedicated cloud server using TCP/IP and the on-site Internet Programmable Thermostats using the IEEE 802.15.4 wireless communication protocol. Additional WGs can be used for a single site, but each WG must meet or exceed these requirements
- B. The WG must provide the following hardware features as a minimum:
  - 1. Single Ethernet Port.
  - 2. One micro-USB 5VDC power input.
  - 3. 2.4 GHz IEEE std. 802.15.4 built-in communication processor.
- C. The WG shall provide the communication link between the entire system and a cloud based server. Communication with cloud server shall be secured using AES (Advanced Encryption Standard).
- D. The WG shall be able to support 2000 Internet Programmable Thermostats.

### 2.03 INTERNET PROGRAMMABLE THERMOSTAT (IPT)

- A. Internet Programmable Thermostat shall be a wireless communicating commercial programmable thermostat that uses IEEE 802.15.4 for networking communication and a wiring terminal block for controlling a single zone HVAC unit.
- B. The IPT shall provide a keypad for setting:
  - 1. Temperature Set points.
  - 2. System Mode (Heat, Cool, Auto, Off).
  - 3. Fan Mode (Auto, On).
  - 4. Light Button.
- C. The IPT shall include a wiring terminal for controlling a single zone HVAC unit. The wiring terminal must be able to be removed from the IPT for installations where only 3-wires exist or are available between where the IPT will be placed and its connection with the HVAC unit it will be controlling. Over these 3-wires the thermostat must still be able to control the HVAC unit based on these specifications.

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- D. The IPT must be configurable using a Web Based App. No thermostat configuration, other than setting the IPT to Conventional, Heat Pump - O, or Heat Pump -B, shall be done at the thermostat. Web based Configuration Setting options shall include:
1. Naming the thermostat
  2. Grouping multiple thermostats.
  3. Heat Pump or Conventional system setting.
  4. If Heat Pump; reversing valve O or B setting.
  5. Cycles Per Hour (1 - 6).
  6. Anticipation Degrees (0°F - 0.5°F)
  7. Calibration Degrees (2.0°F - -2.0°F)
  8. Heat Stages (0 - 2)
  9. If Heat Pump; Aux Heat (Disabled and/or Enabled Option)
  10. Cool Stages (0 - 2)
  11. Fan Stages (1 - 2)
  12. Fan Circulation Minutes Per Hour.
  13. Temperature Display (Fahrenheit or Celsius)
  14. Heat Range Temperature Setting Limitation
  15. Cool Range Temperature Setting Limitation
  16. Ability to disable and enable Keypad Control through schedule.
  17. Heat consumption (kw, btu, ton, or watt)
  18. Cool consumption (kw, btu, ton, or watt)
  19. Notification Sensitivity (High, Medium, Low)
  20. Alarm of exceeding temperature based on a Safe Range
  21. Schedule set times (2, 3, 4, or Variable).
- E. IPT settings and control through the Web Base App shall be in real-time and include:
1. Space Temperature
  2. System Mode (Heat, Cool, Auto, Off).
  3. Fan Mode (Auto, On).
  4. Current set point.
  5. Relay status (Heat/Cool and Fan).
  6. Historical Trend Graphs.
  7. Scheduling
  8. Lock and Unlock Entire Thermostat's Keypad
  9. Lock and Unlock the Thermostat's Fan Mode setting Only

#### 2.04 WEB BASED GRAPHICAL USER INTERFACE

- A. The Web Based App (WBA) shall be able to run on any PC that uses Safari, Chrome, Firefox, or any other web browser that meets these browsers' functionality.
- B. The WBA Platform shall be able to run on any Internet Accessible Smartphone and/or Tablet that has a Web Browser compatible with HTML5.

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- C. The WBA shall allow up to a minimum of 100 simultaneous users/clients to access the Energy Management System.
- D. The Web Based client shall support at a minimum, the following functions:
  - 1. User log-on identification and password shall be required.
  - 2. HTML programming shall not be required to display any graphics or data on the Web page.
  - 3. Storage of data shall reside within the cloud server and shall not sit within the client's computer or device. EMS that requires data storage on a client computer or an on-site server is not acceptable.
  - 4. Users shall have administrator and user definable access privileges.
  - 5. OpenAPI interface with XML data output.
- E. Schedules:
  - 1. The WBA shall provide user with access to setting Internet Programmable Thermostat (IPT) schedules. Up to 12 schedule periods per day shall be available for each IPT.
  - 2. Schedules shall be available as Weekly (7-day), Daily, or Weekday/Weekend (5-2).
  - 3. The WBA shall provide the user the ability to:
    - a. View Schedules.
    - b. Add/Modify Schedules.
    - c. Assign Thermostat to a Group Schedule.
    - d. Delete Schedules.
- F. Trending
  - 1. The WBA shall provide real-time trend information on:
    - a. Each IPT's space temperature.
    - b. Each IPT's temperature set points.
    - c. Each IPT's current call; heat, cool, and/or fan.
    - d. Each IEE's call for economization
  - 2. The WBA shall be able to record and provide at least two years of past trend data for every thermostat in the wireless network. Trend data shall include:
    - a. space temperature; with resolution of every 1/10th of a degree Fahrenheit.
    - b. IPT's temperature set points.
    - c. indication of whether the thermostat was calling for; heat, cool, and/or fan.
  - 3. Trend data shall be viewable on the WBS
- G. Alarm Notifications
  - 1. The WBA shall provide automatic alarming functionally based on real-time monitoring of at least:
    - a. space temperature and temperature change.
    - b. IPT's temperature set points.
    - c. IPT's current call; heat, cool, and/or fan.
  - 2. The WBA shall be able to provide a user with the ability to:
    - a. View Alarms.
    - b. Set Alarm Notification sensitivity level to High, Medium, or Low.

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c. Delete Alarms.

3. Alarms shall be able to be sent via email and/or text message to up to 100 or more clients.

#### H. Consumption Usage

1. The WBA shall be able to calculate and graphically display the consumption of running a single zone HVAC unit based on a user defined HVAC unit heat and/or cool consumption rate multiplied by the thermostat heat/cool call time.
2. The WBA shall be able to calculate and graphically display the cost of consumption of running a single zone HVAC unit based on taking a user defined HVAC unit heat and/or cool consumption and multiplying that by the client defined cost per kw and/or therm.
3. The WBA shall be able to display consumption usage for a single thermostat, multiple thermostats at a single time, or all the thermostats in the EMS.
4. The WBA shall be able to record and display up to at least two years of consumption usage information.

### 2.05 WIRED REMOTE TEMPERATURE SENSORS AND DIGITAL ALARM INPUT

#### A. Input Temperature Sensor (ITS).

1. The ITS shall connect to the Internet Programmable Thermostat over 3-wires.
2. ITS shall provide at least one external 10K Type II thermistor temperature sensor input.
3. Web Based App shall be able to record and provide at least two years of past temperature data for ITS.
4. The trend data shall be viewable on the WBA.
5. ITS must be accurate to  $\pm 1.0^{\circ}\text{F}$
6. ITS must be able to be installed up to 500' away from IPT using standard thermostat wiring.

#### B. Internet Enabled Economizer (IEE)

1. The IEE shall connect to the Internet Programmable Thermostat (ITS) with ONLY 3-wires. No additional wiring must be required between the IEE and the ITS to gain complete Title 24 compliant economization control.
2. IEE shall provide up to three 10K Type II external thermistor temperature sensor input.
3. Web Based App shall be able to record and provide at least two years of past data for IEE. Data must represent historical representations of:
  - a. Calls for Economization
  - b. Outside Air Damper Position
  - c. Supply and Outside Air Temperature
  - d. The trend data shall be viewable on the WBA.
  - e. IEE must be able to send California Title 24 Fault and Diagnostics codes to the WBA, email addresses, and or text messages.
  - f. IEE must be able to be installed up to 500' away from IPT using standard thermostat wiring.
  - g. IEE must have a settable 0-10VDC output for Outside Air Damper Actuator control.

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- h. IEE must have a settable 0-10VDC output for Variable Frequency Drive (VFD) control.
  - 1) IEE must be configurable for different VFD speeds based on calls for cold, heat, and ventilation.
- i. IEE must have a 0-10VDC input for Outside Air Damper Position Feedback.

## 2.06 WIRELESS PROXIMITY SENSORS

### A. Wireless Proximity Sensor (WPS).

1. The WPS shall connect with the Internet Programmable Thermostat over the 802.15.4 wireless network.
2. WPS shall be powered by 2 AA batteries or equivalent.
3. WPS must be able to be used for either:
  - a. Accepting a motion sensor's 2-wire dry contact output.
    - 1) The WPS shall be able to notify an Internet Programmable Thermostat if a motion sensor's dry contact is in either the open or closed position.
    - 2) Dry contact open positions will indicate that the space is occupied and the IPT must be able to automatically setback its temperature setting by a range of 0F - 10F or OFF.
    - 3) Dry contact closed position will indicate that the space is unoccupied and set the temperature to a comfort setting when the space is occupied.
    - 4) Setback settings and comfort settings must be settable through the Internet Programmable Thermostat's schedule through the Web Based App (cannot be settable at thermostat).
    - 5) Web Based App must be able to display when a space is "Unoccupied".
  - b. Detecting if a Window OR Door is Opened or Closed.
    - 1) The WPS must have a built-in magnetic sensor and come with a magnet that can be installed on a door OR window.
    - 2) The WPS must be able to notify an Internet Programmable Thermostat if the door is open and the IPT must automatically turn to the OFF position.
    - 3) The WPS must be able to notify an Internet Programmable Thermostat if the door is closed and the IPT must automatically return to its last temperature and system settings.
    - 4) Web Based App must be able to display when the Door OR Window is Open and must be able to be set to indicate "Door" or "Window".
  - c. Web Based App shall be able to notify if the WPS batteries are low and record and provide at least two years of past history on occupancy and/or door/window status for each space a WPS is installed in.
  - d. The trend data shall be viewable on the Web Based App.
  - e. Internet Programmable Thermostat must be able to connect with at least 8 WPS, each WPS must have a unique serial number and each WPS shall be settable, through the Web Based App, as either a motion sensor input or as a door/window sensor.

## PART 3 – EXECUTION

### 3.01 CONTRACTOR RESPONSIBILITIES

#### A. General



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1. Installation of the Energy Management System shall be performed by an approved Contractor. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a subcontractor without prior written approval of the owner.
- B. Demolition
  1. Remove controls which do not remain as part of the Energy Management System. The Owner will inform the Contractor of any equipment which is to be removed that will remain the property of the Owner. All other equipment which is removed will be disposed of by the Contractor.
- C. Access to Site
  1. Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the District or the District's Representative.
- D. Code Compliance
  1. All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations.
- E. Cleanup
  1. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

### 3.02 **WIRING, CONDUIT, AND CABLE**

- A. All control wires between HVAC units and thermostat locations to be furnished and installed by others. The EMS contractor shall not begin work on this contract until all wiring is installed to the satisfaction of the EMS contractor. The EMS contractor shall provide wiring between remote temperature sensors, TA1 and thermostats as required, unless noted otherwise in drawings or specifications.

### 3.03 **HARDWARE INSTALLATION**

- A. Installation Practices for Devices
  1. All devices are to be mounted level/plumb and per the manufacturer's installation documentation.
- B. Identification
  1. Identify all control wires with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross-referenced with ss-built drawings.
  2. All field enclosures, other than controllers, shall be identified with a back lite nameplate. The lettering shall be in white against a black or blue background.
  3. Junction box covers will be marked to indicate that they are a part of the EMS system.
  4. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
  5. All I/O field devices inside FIP's shall be labeled.
- C. Existing Controls.
  1. Existing controls are not to be reused. All EMS devices will be new.
- D. Control System Switch-over
  1. The Contractor shall minimize control system downtime during switch-over. Sufficient installation mechanics will be on site so that the entire switch-over can be

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accomplished in a reasonable time frame.

E. Location

1. The location of sensors is per architectural drawings.
2. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light and diffuser air streams.
3. If Input Temperature Sensor(s) (ITS) is used as Outdoor air sensor, Outdoor air sensors will be mounted on the north building face directly in the outside air. Install sensors such that the effects of heat radiated from the building or sunlight is minimized.
4. If any line voltage electrical control is being installed, field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

### 3.04 SYSTEM PROGRAMMING

A. General.

1. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software.
2. Contractor shall work with owner's representative to determine programming parameters including but not limited to hours of operation, set points, system variables, thermostat naming, and site naming. Thermostat & Site naming shall be performed by the contractor. Naming convention (equipment # or name, or space served) shall be provided by or agreed upon with the Owner.

### 3.05 COMMISSIONING AND SYSTEM STARTUP

A. EMS device functional testing.

1. Each system for which a EMS device has been installed shall be tested for proper installation and functional operation. Test shall include on-site control test to verify each wireless device is responding to signals sent from cloud based servers and responding in accordance with manufacture's specifications.

**END OF SECTION**

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**SECTION 260519**  
**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Underground feeder and branch-circuit cable.
- C. Service entrance cable.
- D. Metal-clad cable.
- E. Wiring connectors.
- F. Electrical tape.
- G. Heat shrink tubing.
- H. Wire pulling lubricant.
- I. Cable ties.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- B. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.
- C. Section 284600 - Fire Detection and Alarm: Fire alarm system conductors and cables.
- D. Section 312316 - Excavation.
- E. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.
- F. Section 312323 - Fill: Bedding and backfilling.

**1.03 REFERENCE STANDARDS**

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010 (Reapproved 2014).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2014).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes 2013.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- H. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF) 2007.
- I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2009.
- J. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

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- K. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.
- M. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.
- N. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.
- O. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.
- P. UL 486D - Sealed Wire Connector Systems Current Edition, Including All Revisions.
- Q. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables Current Edition, Including All Revisions.
- R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.
- S. UL 854 - Service-Entrance Cables Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
  - 3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
  - 4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Field Quality Control Test Reports.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

#### 1.06 QUALITY ASSURANCE

- A. Conform to requirements of CEC.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

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## **PART 2 PRODUCTS**

### **2.01 CONDUCTOR AND CABLE APPLICATIONS**

- A. Do not use conductors and cables for applications other than as permitted by CEC and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.

### **2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS**

- A. Provide products that comply with requirements of CEC.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 260526.
- H. Conductor Material:
  - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
  - 3. Tinned Copper Conductors: Comply with ASTM B33.
- I. Minimum Conductor Size:
  - 1. Branch Circuits: 12 AWG.
    - a. Exceptions:
      - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
      - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
      - 3) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.
- J. Where conductor size is not indicated, size to comply with CEC but not less than applicable minimum size requirements specified.
- K. Conductor Color Coding:
  - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  - 2. Color Coding Method: Integrally colored insulation.
  - 3. Color Code:
    - a. 480Y/277 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.
      - 3) Phase C: Yellow.

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- 4) Neutral/Grounded: Gray.
- b. 208Y/120 V, 3 Phase, 4 Wire System:
  - 1) Phase A: Black.
  - 2) Phase B: Red.
  - 3) Phase C: Blue.
  - 4) Neutral/Grounded: White.
- c. Equipment Ground, All Systems: Green.

### 2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
  - 1. Copper Building Wire:
    - a. General Cable Technologies Corporation; [\_\_\_\_]: [www.generalcable.com/#sle](http://www.generalcable.com/#sle).
    - b. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
    - c. America Insulated Wire Corp..
    - d. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
  - 1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
    - b. Size 8 AWG and Larger: Stranded.
  - 2. Control Circuits: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
  - 1. Copper Building Wire: Type N/A.
    - a. Installed Underground: Type XHHW-2.
    - b. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

### 2.04 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

- A. Manufacturers:
  - 1. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
  - 2. America Insulated Wire Corp.
- B. Description: CEC, Type UF multiple-conductor cable listed and labeled as complying with UL 493, Type UF-B.
- C. Provide equipment grounding conductor unless otherwise indicated.
- D. Conductor Stranding:
  - 1. Size 10 AWG and Smaller: Solid.
  - 2. Size 8 AWG and Larger: Stranded.
- E. Insulation Voltage Rating: 600 V.

### 2.05 SERVICE ENTRANCE CABLE

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- A. Manufacturers:
  - 1. Copper Service Entrance Cable:
    - a. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
    - b. America Insulated Wire Corp.
- B. Service Entrance Cable for Underground Use: CEC, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2 and with UL 44 Type RHH/RHW-2.
- C. Conductor Stranding: Stranded.
- D. Insulation Voltage Rating: 600 V.

## 2.06 **WIRING CONNECTORS**

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Wiring Connectors for Splices and Taps:
  - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
  - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- C. Wiring Connectors for Terminations:
  - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
  - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
  - 3. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
- D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
  - 1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
- G. Mechanical Connectors: Provide bolted type or set-screw type.
- H. Compression Connectors: Provide circumferential type or hex type crimp configuration.
- I. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

## 2.07 **WIRING ACCESSORIES**

- A. Electrical Tape:
  - 1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.

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2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
  5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
  6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18 mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.
- C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.
- D. Cable Ties: Material and tensile strength rating suitable for application.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with CEC.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 PREPARATION**

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

#### **3.03 INSTALLATION**

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- A. Circuiting Requirements:
  - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
  - 2. When circuit destination is indicated and routing is not shown, determine exact routing required.
  - 3. Arrange circuiting to minimize splices.
  - 4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location shown.
  - 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with CEC.
  - 6. Maintain separation of wiring for emergency systems in accordance with CEC.
  - 7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are shown as separate, combining them together in a single raceway is not permitted.
  - 8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.
- D. Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.
- E. Installation in Raceway:
  - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  - 2. Pull all conductors and cables together into raceway at same time.
  - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- G. Secure and support conductors and cables in accordance with CEC using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- H. Terminate cables using suitable fittings.
- I. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with CEC.
- L. Make wiring connections using specified wiring connectors.
  - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.

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2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  3. Do not remove conductor strands to facilitate insertion into connector.
  4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
  5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape or heat shrink tubing.
    - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
    - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
  2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape or heat shrink tubing.
    - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
    - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
  3. Wet Locations: Use heat shrink tubing.
- N. Insulate ends of spare conductors using vinyl insulating electrical tape.
- O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- P. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

### 3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Perform inspection, testing and adjusting in accordance with Section 014000.
- C. Inspect and test in accordance with NETA ATS, except Section 4.
- D. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- E. Correct deficiencies and replace damaged or defective conductors and cables.

### END OF SECTION

260519 - 8	Low-Voltage Electrical Power Conductors and Cables
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## SECTION 260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.
- F. Ground access wells.

#### 1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
  - 1. Includes oxide inhibiting compound.
- B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 265600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

#### 1.03 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings 2007.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- E. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
  - 2. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

#### 1.05 SUBMITTALS

- A. See Section 01 3300 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

#### 1.06 QUALITY ASSURANCE

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- A. Conform to requirements of CEC.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

## PART 2 PRODUCTS

### 2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Do not use products for applications other than as permitted by CEC and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with CEC but not less than applicable minimum size requirements specified.
- D. Grounding System Resistance:
  - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
  - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
  - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- E. Grounding Electrode System:
  - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    - a. Provide continuous grounding electrode conductors without splice or joint.
    - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
  - 2. Metal In-Ground Support Structure:
    - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with CEC.
  - 3. Concrete-Encased Electrode:
    - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with CEC.
  - 4. Ground Ring:
    - a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches (750 mm).
    - b. Provide connection from ground ring conductor to:
      - 1) Ground rod electrodes located as indicated.
  - 5. Ground Rod Electrode(s):

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- a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
    - b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
    - c. Where location is not indicated, locate electrode(s) at least 5 feet (1.5 m) outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
  6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
  7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in CEC. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
    - a. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
    - b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
    - c. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.
  8. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in CEC.
- F. Service-Supplied System Grounding:
1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
  2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- G. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
1. Provide grounding electrode system for each separate building or structure.
  2. Provide equipment grounding conductor routed with supply conductors.
  3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
  4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.
- H. Separately Derived System Grounding:
1. Separately derived systems include, but are not limited to:
    - a. Transformers (except autotransformers such as buck-boost transformers).
  2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
  3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system.

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Make connection at same location as grounding electrode conductor connection.

4. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
  5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.
- I. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with CEC.
  2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
  3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with CEC.
  4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
  5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
  6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
- J. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with CEC.
  2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
    - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
    - b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
    - c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
- K. Pole-Mounted Luminaires: Also comply with Section 265600.

## 2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
  2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
1. Use insulated copper conductors unless otherwise indicated.
    - a. Exceptions:

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- 1) Use bare copper conductors where installed underground in direct contact with earth.
- 2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors or exothermic welded connections for accessible connections.

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:

1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.
4. Manufacturers:
  - a. Weaver.
  - b. Substitutions: See Section 016000 - Product Requirements.

F. Ground Access Wells:

1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches (250 mm).
4. Cover: Factory-identified by permanent means with word "GROUND".
5. Manufacturers:
  - a. Oldcastle Precast.
  - b. Substitutions: See Section 016000 - Product Requirements.

G. Ground Bushing:

1. Manufacturers:
  - a. O-Z/Gedney
  - b. Substitutions: See Section 01 6000 - Product Requirements.

H. Oxide Inhibiting Compound: Comply with Section 260519.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

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- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with CEC or provide ground plates..
  - 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.
- D. Make grounding and bonding connections using specified connectors.
  - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Identify grounding and bonding system components in accordance with Section 260553.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Perform inspection, testing and adjusting in accordance with Section 014000.
- C. Inspect and test in accordance with NETA ATS except Section 4.
- D. Perform inspections and tests listed in NETA ATS, Section 7.13.
- E. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- F. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

**END OF SECTION**



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## SECTION 260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

#### 1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- C. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- D. Section 265600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

#### 1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2015.
- D. MFMA-4 - Metal Framing Standards Publication 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- F. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 5B - Strut-Type Channel Raceways and Fittings Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

#### 1.05 SUBMITTALS

- A. See Section 01 3300 - Administrative Requirements, for submittal procedures.

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- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, non-penetrating rooftop supports and post-installed concrete and masonry anchors.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

#### 1.06 QUALITY ASSURANCE

- A. Comply with CEC.
- B. Comply with applicable building code.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### PART 2 PRODUCTS

#### 2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
  - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
  - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
  - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 3:1. Include consideration for vibration, equipment operation, and shock loads where applicable.
  - 4. Do not use products for applications other than as permitted by CEC and product listing.
  - 5. Do not use wire, chain, perforated pipe strap or wood for permanent supports unless specifically indicated or permitted.
  - 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel or approved equivalent unless otherwise indicated.
    - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
  - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  - 2. Conduit Clamps: Bolted type unless otherwise indicated.
  - 3. Manufacturers:
    - a. Cooper Crouse-Hinds, a division of Eaton Corporation:  
[www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
    - b. O-Z/Gedney, a brand of Emerson Industrial Automation:  
[www.emersonindustrial.com/#sle](http://www.emersonindustrial.com/#sle).

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- c. Substitutions: See Section 016000 - Product Requirements.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
  - 1. Comply with MFMA-4.
  - 2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
  - 3. Channel Material:
    - a. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
  - 4. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch (2.66 mm).
  - 5. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
  - 6. Manufacturers:
    - a. Unistrut, a brand of Atkore International Inc: [www.unistrut.com/#sle](http://www.unistrut.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
- F. Anchors and Fasteners:
  - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  - 2. Concrete: Use expansion anchors or screw anchors.
  - 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
  - 4. Hollow Masonry: Use toggle bolts.
  - 5. Hollow Stud Walls: Use toggle bolts.
  - 6. Steel: Use beam clamps, machine bolts or welded threaded studs.
  - 7. Sheet Metal: Use sheet metal screws.
  - 8. Plastic and lead anchors are not permitted.
  - 9. Powder-actuated fasteners are not permitted.
  - 10. Hammer-driven anchors and fasteners are not permitted.
  - 11. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
  - 12. Manufacturers - Mechanical Anchors:
    - a. Hilti, Inc: [www.us.hilti.com/#sle](http://www.us.hilti.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that mounting surfaces are ready to receive support and attachment components.
- B. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.

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- B. Install support and attachment components in a neat and workmanlike manner in accordance with NECA 1.
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Equipment Support and Attachment:
  - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Conduit Support and Attachment: Also comply with Section 260533.13.
- J. Box Support and Attachment: Also comply with Section 260533.16.
- K. Exterior Luminaire Support and Attachment: Also comply with Section 265600.
- L. Secure fasteners according to manufacturer's recommended torque settings.
- M. Remove temporary supports.
- N. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with CEC.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

### END OF SECTION

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## SECTION 260533.13 CONDUIT FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. PVC-coated galvanized steel rigid metal conduit (RMC).
- D. Liquidtight flexible metal conduit (LFMC).
- E. Electrical metallic tubing (EMT).
- F. Rigid polyvinyl chloride (PVC) conduit.
- G. Conduit fittings.
- H. Accessories.

#### 1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete encasement of conduits.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
  - 1. Includes additional requirements for fittings for grounding and bonding.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260533.16 - Boxes for Electrical Systems.
- E. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.
- F. Section 271000 - Structured Cabling: Additional requirements for communications systems conduits.
- G. Section 312316 - Excavation.
- H. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.
- I. Section 312323 - Fill: Bedding and backfilling.

#### 1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2015.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC) 2005.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2013.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2003.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit 2018.
- I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit 2013.
- J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing 2016.

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- K. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
- M. UL 360 - Liquid-Tight Flexible Steel Conduit Current Edition, Including All Revisions.
- N. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
- O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings Current Edition, Including All Revisions.
- P. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.
- Q. UL 1242 - Electrical Intermediate Metal Conduit-Steel Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
  - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
  - 5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

#### 1.05 SUBMITTALS

- A. See Section 01 3300 - Submittal Procedures for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

#### 1.06 QUALITY ASSURANCE

- A. Conform to requirements of CEC.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

### PART 2 PRODUCTS

#### 2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by CEC and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:

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1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit.
  2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit.
  3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
  4. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
  5. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
  6. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches (100 mm) on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.
- D. Embedded Within Concrete:
1. Within Slab on Grade: Not permitted.
- E. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC) or PVC-coated galvanized steel rigid metal conduit.
- F. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

## 2.02 CONDUIT REQUIREMENTS

- A. Electrical Service Conduits: Also comply with Section 262100.
- B. Communications Systems Conduits: Also comply with Section 271000.
- C. Fittings for Grounding and Bonding: Also comply with Section 260526.
- D. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- E. Provide products listed, classified, and labeled as suitable for the purpose intended.
- F. Minimum Conduit Size, Unless Otherwise Indicated:
  1. Branch Circuits: 1/2 inch (16 mm) trade size.
  2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
  3. Underground, Interior: 3/4 inch (21 mm) trade size.
  4. Underground, Exterior: 1 inch (27 mm) trade size.
- G. Where conduit size is not indicated, size to comply with CEC but not less than applicable minimum size requirements specified.

## 2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
  1. Allied Tube & Conduit: [www.alliedeg.com/#sle](http://www.alliedeg.com/#sle).
  2. Substitutions: See Section 016000 - Product Requirements.
- B. Description: CEC, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

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C. Fittings:

1. Manufacturers:
  - a. Appleton Electric Co..
  - b. Substitutions: See Section 016000 - Product Requirements.
2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

**2.04 INTERMEDIATE METAL CONDUIT (IMC)**

A. Manufacturers:

1. Allied Tube & Conduit: [www.alliedeg.com/#sle](http://www.alliedeg.com/#sle).
2. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:

1. Manufacturers:
  - a. Appleton Electric Co..
  - b. Substitutions: See Section 016000 - Product Requirements.
2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

**2.05 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

A. Manufacturers:

1. Allied Tube and Conduit Co..
2. Substitutions: See Section 016000 - Product Requirements.

B. Description: CEC, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil (1.02 mm).

D. PVC-Coated Fittings:

1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil (1.02 mm).

E. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil (0.38 mm).

**2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**



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- A. Description: CEC, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.

## 2.07 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
  - 1. Allied Tube & Conduit: [www.alliedeg.com/#sle](http://www.alliedeg.com/#sle).
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Description: CEC, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
  - 1. Manufacturers:
    - a. Appleton Electric Co..
    - b. Substitutions: See Section 016000 - Product Requirements.
  - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 3. Material: Use steel or malleable iron.
  - 4. Connectors and Couplings: Use compression (gland) or set-screw type.
    - a. Do not use indenter type connectors and couplings.

## 2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Manufacturers:
  - 1. Allied Tube and Conduit Co..
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Description: CEC, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- C. Fittings:
  - 1. Manufacturer: Same as manufacturer of conduit to be connected.
  - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

## 2.09 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).

## PART 3 EXECUTION

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### 3.01 EXAMINATION

- A. Verify that mounting surfaces are ready to receive conduits.
- B. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- G. Conduit Routing:
  - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
  - 2. When conduit destination is indicated and routing is not shown, determine exact routing required.
  - 3. Conceal all conduits unless specifically indicated to be exposed.
  - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
    - a. Electrical rooms.
    - b. Mechanical equipment rooms.
  - 5. Unless otherwise approved, do not route conduits exposed:
    - a. Across floors.
    - b. Across roofs.
    - c. Across top of parapet walls.
    - d. Across building exterior surfaces.
  - 6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
  - 7. Arrange conduit to maintain adequate headroom, clearances, and access.
  - 8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
  - 9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
  - 10. Route conduits above water and drain piping where possible.
  - 11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
  - 12. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
  - 13. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
    - a. Heaters.
    - b. Hot water piping.

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c. Flues.

14. Group parallel conduits in the same area together on a common rack.

#### H. Conduit Support:

1. Secure and support conduits in accordance with CEC and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
  - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
8. Use of wire for support of conduits is not permitted.
9. Where conduit support intervals specified in CEC and NECA standards differ, comply with the most stringent requirements.

#### I. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

#### J. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.

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5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
  6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
  8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- K. Underground Installation:
1. Provide trenching and backfilling in accordance with Section 312316.13.
  2. Minimum Cover, Unless Otherwise Indicated or Required:
    - a. Underground, Exterior: 24 inches (610 mm).
- L. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 033000 with minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated.
- M. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  2. Where conduits are subject to earth movement by settlement or frost.
- N. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
  2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- O. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.
- P. Provide grounding and bonding in accordance with Section 260526.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

### 3.04 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

### 3.05 PROTECTION

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- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

**END OF SECTION**

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## SECTION 260533.16 BOXES FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).
- C. Underground boxes/enclosures.

#### 1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete.
- B. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- C. Section 260526 - Grounding and Bonding for Electrical Systems.
- D. Section 260529 - Hangers and Supports for Electrical Systems.
- E. Section 260533.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
- F. Section 337119 - Electrical Underground Ducts, Ductbanks, and Manholes: Concrete manholes for electrical systems.

#### 1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2018.
- F. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- I. UL 508A - Industrial Control Panels 2013.
- J. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by CEC.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

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3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to CEC.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to CEC.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes and underground boxes/enclosures.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes and underground boxes/enclosures.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 016000 - Product Requirements, for additional provisions.
  2. Keys for Lockable Enclosures: Two of each different key.

#### 1.06 QUALITY ASSURANCE

- A. Conform to requirements of CEC.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### PART 2 PRODUCTS

#### 2.01 BOXES

- A. General Requirements:
  1. Do not use boxes and associated accessories for applications other than as permitted by CEC and product listing.
  2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  3. Provide products listed, classified, and labeled as suitable for the purpose intended.

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4. Where box size is not indicated, size to comply with CEC but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
  1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  3. Use suitable concrete type boxes where flush-mounted in concrete.
  4. Use suitable masonry type boxes where flush-mounted in masonry walls.
  5. Use raised covers suitable for the type of wall construction and device configuration where required.
  6. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  7. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  8. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
  1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    - a. Indoor Clean, Dry Locations: Type 1, painted steel.
    - b. Outdoor Locations: Type 3R, painted steel.
  3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
- D. Underground Boxes/Enclosures:
  1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
  2. Size: As indicated on drawings.
  3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
  4. Applications:
    - a. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on drawings.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.



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### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and CEC.
- D. Box Locations:
  - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
  - 2. Unless dimensioned, box locations indicated are approximate.
  - 3. Locate boxes as required for devices installed under other sections or by others.
  - 4. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    - a. Concealed above accessible suspended ceilings.
    - b. Within joists in areas with no ceiling.
    - c. Electrical rooms.
    - d. Mechanical equipment rooms.
- E. Box Supports:
  - 1. Secure and support boxes in accordance with CEC and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
  - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with CEC. Do not provide support from piping, ductwork, or other systems.
- F. Install boxes plumb and level.
- G. Install boxes as required to preserve insulation integrity.
- H. Underground Boxes/Enclosures:
  - 1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
  - 2. Flush-mount enclosures located in concrete or paved areas.
  - 3. Mount enclosures located in landscaped areas with top at 1 inch (25 mm) above finished grade.
  - 4. Provide cast-in-place concrete collar constructed in accordance with Section 033000, minimum 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep), around enclosures that are not located in concrete areas.
  - 5. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- I. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- J. Close unused box openings.
- K. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- L. Provide grounding and bonding in accordance with Section 260526.

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### 3.03 **CLEANING**

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

### 3.04 **PROTECTION**

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

**END OF SECTION**

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**SECTION 260548**  
**VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Seismic control requirements.
- B. Seismic restraint systems.

**1.02 RELATED REQUIREMENTS**

- A. Section 014533 - Code-Required Special Inspections and Procedures.
- B. Section 033000 - Cast-in-Place Concrete.
- C. Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- D. Section 260529 - Hangers and Supports for Electrical Systems.

**1.03 DEFINITIONS**

- A. Electrical Component: Where referenced in this section in regards to seismic controls, applies to any portion of the electrical system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g. conduit, cable tray).
- B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

**1.04 REFERENCE STANDARDS**

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASCE 19 - Structural Applications of Steel Cables for Buildings 2016.
- C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2017.
- E. FEMA 413 - Installing Seismic Restraints for Electrical Equipment 2004.
- F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage 2012.
- G. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components 2010, with Editorial Revision (2015).
- I. MFMA-4 - Metal Framing Standards Publication 2004.
- J. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- K. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems 2008.

**1.05 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.

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2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  4. Seismic Controls:
    - a. Coordinate the arrangement of seismic restraints with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
    - b. Coordinate the work with other trades to accommodate relative positioning of essential and non-essential components in consideration of seismic interaction.
  5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

#### 1.06 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings - Seismic Controls:
1. Include dimensioned plan views and sections indicating proposed electrical component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
  2. Identify mounting conditions required for equipment seismic qualification.
  3. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
  4. Indicate proposed arrangement of distributed system trapeze support groupings.
  5. Indicate proposed locations for distributed system flexible fittings and/or connections.
  6. Indicate locations of seismic separations where applicable.

#### 1.07 QUALITY ASSURANCE

- A. Comply with CEC.
- B. Comply with applicable building code.

### PART 2 PRODUCTS

#### 2.01 SEISMIC CONTROL REQUIREMENTS

- A. Design and provide electrical component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor electrical components.
- B. Seismic Design Criteria: ICC (IBC).
- C. Component Importance Factor (Ip): Electrical components to be assigned a component importance factor (Ip) of 1.0 unless otherwise indicated.
- D. Seismic Restraints:
1. Provide seismic restraints for electrical components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.

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2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
    - a. ASHRAE (HVACA).
    - b. FEMA 413.
    - c. FEMA E-74.
    - d. SMACNA (SRM).
  3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third party registered professional engineer acceptable to authorities having jurisdiction.
- E. Seismic Attachments:
1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
  2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
  3. Do not use power-actuated fasteners.
  4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
  5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
  6. Concrete Housekeeping Pads:
    - a. Increase size of pad as required to comply with anchor requirements.
    - b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.
- F. Seismic Interactions:
1. Include provisions to prevent seismic impact between electrical components and other structural or nonstructural components.
  2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
- G. Seismic Relative Displacement Provisions:
1. Use suitable fittings or flexible connections to accommodate:
    - a. Relative displacements at connections between components, including distributed systems (e.g. conduit, cable tray); do not exceed load limits for equipment utility connections.
    - b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
    - c. Design displacements at seismic separations.
    - d. Anticipated drifts between floors.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

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- A. Verify that field measurements are as shown on the drawings.
- B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 CODE-REQUIRED SPECIAL INSPECTIONS

- A. Applies to all items listed in California Building Code (CBC) Sections 1705A.13.3 and 1705A.13.3.1
- B. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 014533 and statement of special inspections as required by applicable building code.
- C. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
  - 1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
  - 2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.
- D. Seismic special inspections include, but are not limited to:
  - 1. Seismically Qualified Equipment: Verification that label, anchorage and mounting conform to certificate of compliance.
- E. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.
- F. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

### 3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Secure fasteners according to manufacturer's recommended torque settings.
- E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- F. Seismic Controls:
  - 1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris or other obstructions.
  - 2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
  - 3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch (3 mm), use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch (3 mm) or less.
  - 4. Equipment with Sheet Metal Housings:

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- a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
  - b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
  - c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
- 5. Concrete Housekeeping Pads:
  - a. Size in accordance with seismic design to meet anchor requirements.
  - b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.

#### 3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect vibration isolation and/or seismic control components for damage and defects.
- C. Seismic Controls:
  - 1. Verify snubbing element air gaps.
- D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

**END OF SECTION**

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## SECTION 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Floor marking tape.
- G. Warning signs and labels.

#### 1.02 RELATED REQUIREMENTS

- A. Section 099113 - Exterior Painting.
- B. Section 099123 - Interior Painting.
- C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- D. Section 271000 - Structured Cabling: Identification for communications cabling and devices.

#### 1.03 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels 2011.
- C. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
  - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
  - 2. Do not install identification products until final surface finishes and painting are complete.

#### 1.05 SUBMITTALS

- A. See Section 01 3300 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

#### 1.06 QUALITY ASSURANCE



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- A. Conform to requirements of CEC.

## 1.07 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

## PART 2 PRODUCTS

### 2.01 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    - a. Switchboards:
      - 1) Identify voltage and phase.
      - 2) Identify power source and circuit number. Include location when not within sight of equipment.
      - 3) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
    - b. Panelboards:
      - 1) Identify voltage and phase.
      - 2) Identify power source and circuit number. Include location when not within sight of equipment.
      - 3) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
      - 4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
      - 5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
    - c. Transformers:
      - 1) Identify kVA rating.
      - 2) Identify power source and circuit number. Include location when not within sight of equipment.
    - d. Enclosed switches, circuit breakers and motor controllers:
      - 1) Identify voltage and phase.
      - 2) Identify power source and circuit number. Include location when not within sight of equipment.
  2. Service Equipment:
    - a. Use identification nameplate to identify each service disconnecting means.
    - b. Use identification nameplate at each piece of service equipment to identify the available fault current and the date calculations were performed.
  3. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
  4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.

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5. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
  6. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
  7. Use field-painted floor markings, floor marking tape or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
    - a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches (76 mm) wide, painted in accordance with Section 099123 and 099113.
  8. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by CEC including but not limited to the following.
    - a. Service equipment.
    - b. Elevator control panels.
  9. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
    - a. --CHOOSE ONE OF THE TWO SUBPARAGRAPHS BELOW--
    - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
  10. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
- B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
  2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
  3. Manufacturers:
    - a. Thomas and Betts Corp.
    - b. Substitutions: See Section 01 6000 - Product Requirements.
- C. Identification for Raceways:
1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet (6.1 m).
  2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet (6.1 m).
    - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.
      - 1) Color Code:
        - (a) Emergency Power System: Red.

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(b) Fire Alarm System: Red.

2) Field-Painting: Comply with Section 099123 and 099113.

3) Vinyl Color Coding Electrical Tape: Comply with Section 260519.

D. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.
2. Use voltage markers or color coded boxes to identify systems other than normal power system.
  - a. Color-Coded Boxes: Field-painted in accordance with Section 099123 and 099113 per the same color code used for raceways.

E. Identification for Devices:

1. Identification for Communications Devices: Comply with Section 271000.
2. Wiring Device and Wallplate Finishes: Comply with Section 262726.
3. Use identification label to identify fire alarm system devices.
4. Use identification label or engraved wallplate to identify serving branch circuit [ ].
  - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
5. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

F. Identification for Luminaires:

1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

## 2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:
  - a. Indoor Clean, Dry Locations: Use plastic nameplates.
  - b. Outdoor Locations: Use plastic, stainless steel or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
  - a. Use only for indoor locations.

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2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
  1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
  2. Legend:
    - a. System designation where applicable:
      - 1) Emergency Power System: Identify with text "EMERGENCY".
      - 2) Fire Alarm System: Identify with text "FIRE ALARM".
    - b. Equipment designation or other approved description.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height:
    - a. System Designation: 1 inch (25 mm).
    - b. Equipment Designation: 1/2 inch (13 mm).
  5. Color:
    - a. Normal Power System: White text on black background.

#### 2.03 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Minimum Text Height: 1/8 inch (3 mm).
- F. Color: Black text on white background unless otherwise indicated.

#### 2.04 VOLTAGE MARKERS

- A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth or vinyl snap-around type markers.
- B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- C. Minimum Size:
  1. Markers for Equipment: 1 1/8 by 4 1/2 inches (29 by 110 mm).
  2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
  3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
  4. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).
- D. Legend:
  1. Markers for Voltage Identification: Highest voltage present.
  2. Markers for System Identification:
- E. Color: Black text on orange background unless otherwise indicated.

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## 2.05 UNDERGROUND WARNING TAPE

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
- C. Foil-backed Detectable Type Tape: 3 inches (76 mm) wide, with minimum thickness of 5 mil (0.1 mm), unless otherwise required for proper detection.
- D. Legend: Type of service, continuously repeated over full length of tape.
- E. Color:

## 2.06 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
  - 1. Materials:
  - 2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
  - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
  - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
  - 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
  - 1. Surface-Mounted Equipment: Enclosure front.
  - 2. Flush-Mounted Equipment: Inside of equipment door.
  - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
  - 4. Elevated Equipment: Legible from the floor or working platform.
  - 5. Branch Devices: Adjacent to device.
  - 6. Conduits: Legible from the floor.
  - 7. Boxes: Outside face of cover.
  - 8. Conductors and Cables: Legible from the point of access.
  - 9. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

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- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.
- G. Mark all handwritten text, where permitted, to be neat and legible.

### 3.03 **FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

**END OF SECTION**

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## SECTION 260583 WIRING CONNECTIONS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

#### 1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 260533.13 - Conduit for Electrical Systems.
- C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables (600 V and Less).
- D. Section 260533.16 - Boxes for Electrical Systems.

#### 1.03 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2015).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2016.
- C. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
  - 2. Determine connection locations and requirements.
- B. Sequencing:
  - 1. Install rough-in of electrical connections before installation of equipment is required.
  - 2. Make electrical connections before required start-up of equipment.

#### 1.05 SUBMITTALS

- A. See Section 01 3300 - Submittal Procedures, for submittal procedures.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

#### 1.06 QUALITY ASSURANCE

- A. Conform to requirements of CEC.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
  - 1. Colors: Conform to NEMA WD 1.
  - 2. Cord Construction: CEC, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
  - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: As specified in Section 262816.16 and in individual equipment sections.

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- C. Flexible Conduit: As specified in Section 260533.13.
- D. Wire and Cable: As specified in Section 260519.
- E. Boxes: As specified in Section 260533.16.

## **2.02 EQUIPMENT CONNECTIONS**

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

#### **3.02 ELECTRICAL CONNECTIONS**

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- C. Provide receptacle outlet to accommodate connection with attachment plug.
- D. Provide cord and cap where field-supplied attachment plug is required.
- E. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- F. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- G. Install terminal block jumpers to complete equipment wiring requirements.
- H. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

**END OF SECTION**



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## SECTION 262100 LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Electrical service requirements.

#### 1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260533.13 - Conduit for Electrical Systems.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 262413 - Switchboards: Service entrance equipment.
- G. Section 312316 - Excavation.
- H. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.
- I. Section 312323 - Fill: Bedding and backfilling.

#### 1.03 DEFINITIONS

- A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in CEC, and as designated by the Utility Company.

#### 1.04 REFERENCE STANDARDS

- A. IEEE C2 - National Electrical Safety Code 2017.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

#### 1.05 ADMINISTRATIVE REQUIREMENTS

- A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.
- B. Coordination:
  - 1. Verify the following with Utility Company representative:
    - a. Utility Company requirements, including division of responsibility.
    - b. Exact location and details of utility point of connection.
    - c. Utility easement requirements.
    - d. Utility Company charges associated with providing service.
  - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
  - 3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

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- C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.
- D. Utility Company charges associated with providing permanent service to be paid by Owner.
- E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.
- F. Scheduling:
  - 1. Arrange for inspections necessary to obtain Utility Company approval of installation.

#### 1.06 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

#### 1.07 QUALITY ASSURANCE

- A. Comply with the following:
  - 1. IEEE C2 (National Electrical Safety Code).
  - 2. California Electrical Code.
  - 3. The requirements of the Utility Company.

### PART 2 PRODUCTS

#### 2.01 ELECTRICAL SERVICE REQUIREMENTS

- A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.
- B. Electrical Service Characteristics:
  - 1. Service Type: Underground.
  - 2. Service Voltage: 480Y/277 V, 3 phase, 60 Hz.
- C. Utility Company: As indicated on drawings.
- D. Division of Responsibility:
  - 1. Pad-Mounted Utility Transformers:
    - a. Transformer Pads: Furnished and installed by Contractor per Utility Company requirements.
    - b. Transformers: Furnished, installed and removed by Utility Company.
    - c. Transformer Grounding Provisions: Furnished and installed by Contractor per Utility Company requirements.
    - d. Primary:
      - 1) Trenching and Backfilling: Provided by Contractor.
      - 2) Conduits: Furnished and installed by Contractor.
      - 3) Conductors: Furnished and installed by Utility Company.
    - e. Secondary:
      - 1) Trenching and Backfilling: Provided by Contractor.
      - 2) Conduits: Furnished and installed by Contractor.
      - 3) Conductors: Furnished and installed by Contractor (Service Point at transformer).
  - 2. Terminations at Service Point: Provided by Utility Company.
  - 3. Metering Provisions:

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- a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.

E. Products Furnished by Contractor: Comply with Utility Company requirements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 PREPARATION**

- A. Verify and mark locations of existing underground utilities.

#### **3.03 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions and Utility Company requirements.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances and required maintenance access.
- D. Provide required trenching and backfilling in accordance with Section 312316.13.
- E. Provide required support and attachment components in accordance with Section 260529.
- F. Provide grounding and bonding for service entrance equipment in accordance with Section 260526.
- G. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 260553.

#### **3.04 PROTECTION**

- A. Protect installed equipment from subsequent construction operations.

**END OF SECTION**

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## SECTION 262200 LOW-VOLTAGE TRANSFORMERS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. General purpose transformers.

#### 1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260533.13 - Conduit for Electrical Systems: Flexible conduit connections.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

#### 1.03 REFERENCE STANDARDS

- A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers Current Edition.
- B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers 2015.
- C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers 2013.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers 2015.
- F. NEMA ST 20 - Dry-Type Transformers for General Applications 2014.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2018.
- H. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 506 - Standard for Specialty Transformers Current Edition, Including All Revisions.
- J. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with placement of support framing and anchors required for mounting of transformers.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.
- C. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.
- D. Source Quality Control Test Reports: Include reports for tests designated in NEMA ST 20 as design and routine tests.
- E. Field Quality Control Test Reports.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection,

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examination, preparation, and installation of product.

- G. Maintenance Data: Include recommended maintenance procedures and intervals.
- H. Project Record Documents: Record actual locations of transformers.

#### 1.06 QUALITY ASSURANCE

- A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

#### 1.08 FIELD CONDITIONS

- A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.
  - 1. Greater than 10 kVA: 104 degrees F (40 degrees C) maximum.

#### 1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Source Limitations: Furnish transformers produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

#### 2.02 TRANSFORMERS - GENERAL REQUIREMENTS

- A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.
- B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
  - 1. Altitude: Less than 3,300 feet (1,000 m).
  - 2. Ambient Temperature:
    - a. Greater than 10 kVA: Not exceeding 104 degrees F (40 degrees C).
  - 3. Ambient Temperature: Not exceeding 86 degrees F (30 degrees C) average or 104 degrees F (40 degrees C) maximum measured during any 24 hour period.
- C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

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- D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.
- E. Basic Impulse Level: 10 kV.
- F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- G. Isolate core and coil from enclosure using vibration-absorbing mounts.
- H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

## 2.03 GENERAL PURPOSE TRANSFORMERS

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.
- B. Primary Voltage: 480 volts delta, 3 phase.
- C. Secondary Voltage: 208Y/120 volts, 3 phase.
- D. Insulation System and Allowable Average Winding Temperature Rise:
  - 1. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- E. Coil Conductors: Continuous copper windings with terminations brazed or welded.
- F. Winding Taps:
  - 1. Less than 3 kVA: None.
  - 2. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
- G. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- H. Sound Levels: Standard sound levels complying with NEMA ST 20
- I. Mounting Provisions:
  - 1. Larger than 75 kVA: Suitable for floor mounting.
- J. Transformer Enclosure: Comply with NEMA ST 20.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Outdoor locations: Type 3R.
  - 2. Construction: Steel.
    - a. 15 kVA and Larger: Ventilated.
  - 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
  - 4. Provide lifting eyes or brackets.

## 2.04 SOURCE QUALITY CONTROL

- A. Factory test transformers according to NEMA ST 20.
- B. Sound Level Tests: Perform factory test designated in NEMA ST 20 as "design" test on each production unit.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.

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- B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.
- C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1.
- B. Install transformers in accordance with manufacturer's instructions.
- C. Install transformers in accordance with NECA 409 and IEEE C57.94.
- D. Use flexible conduit, under the provisions of Section 260533.13, 2 feet (600 mm) minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and CEC.
- F. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by the manufacturer.
- G. Mount floor-mounted transformers on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.
- H. Provide seismic restraints.
- I. Provide grounding and bonding in accordance with Section 260526.
- J. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.
- K. Where not factory-installed, install lugs sized as required for termination of conductors as shown on the drawings.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.

### 3.04 ADJUSTING

- A. Measure primary and secondary voltages and make appropriate tap adjustments.
- B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

### 3.05 CLEANING

- A. Clean dirt and debris from transformer components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

### END OF SECTION

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## SECTION 262413 SWITCHBOARDS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.
- B. Overcurrent protective devices for switchboards.

#### 1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 262100 - Low-Voltage Electrical Service Entrance.
- F. Section 264300 - Surge Protective Devices.

#### 1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e (Amended 2017).
- B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers 2016.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 400 - Standard for Installing and Maintaining Switchboards 2007.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2018.
- F. NEMA PB 2 - Deadfront Distribution Switchboards 2011.
- G. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less 2013.
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- I. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.
- K. UL 891 - Switchboards Current Edition, Including All Revisions.
- L. UL 1053 - Ground-Fault Sensing and Relaying Equipment Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by CEC.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.



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3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
  5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Service Entrance Switchboards:
1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
  2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.
  3. Obtain Utility Company approval of switchboard prior to fabrication.
  4. Preinstallation Meeting: Convene one week prior to commencing work of this section to review requirements with Utility Company representative.
  5. Arrange for inspections necessary to obtain Utility Company approval of installation.

#### 1.05 SUBMITTALS

- A. See Section 01 3300 - Submittal Procedures, for submittal procedures.
- B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- C. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 016000 - Product Requirements, for additional provisions.
  2. Enclosure Keys: Two of each different key.

#### 1.06 QUALITY ASSURANCE

- A. Conform to requirements of CEC.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400 and NEMA PB 2.1.
- B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.
- C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

### PART 2 PRODUCTS

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## 2.01 MANUFACTURERS

- A. Switchboards - Basis of Design: Square D.
- B. Substitutions: See Section 016000 - Product Requirements.

## 2.02 SWITCHBOARDS

- A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.
- D. Service Conditions:
  - 1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
    - a. Altitude: Less than 6,600 feet (2,000 m).
    - b. Ambient Temperature:
      - 1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
  - 2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- E. Short Circuit Current Rating:
  - 1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- F. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.
- G. Bussing: Sized in accordance with UL 891 temperature rise requirements.
  - 1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
  - 2. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
  - 3. Phase and Neutral Bus Material: Copper.
  - 4. Ground Bus Material: Copper.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
  - 1. Line Conductor Terminations:
    - a. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
    - b. Main and Neutral Lug Type: Mechanical.
  - 2. Load Conductor Terminations:
    - a. Lug Material: Copper, suitable for terminating copper conductors only.
    - b. Lug Type:
      - 1) Provide compression lugs where indicated.

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- I. Enclosures:
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Outdoor Locations: Type 3R.
  - 2. Finish: Manufacturer's standard unless otherwise indicated.
  - 3. Outdoor Enclosures:
    - a. Color: Manufacturer's standard.
    - b. Access Doors: Lockable, with all locks keyed alike.
- J. Future Provisions:
  - 1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 264300, list switchboards as a complete assembly including surge protective device.
- L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
  - 1. Where overcurrent protective devices equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
- M. Instrument Transformers:
  - 1. Comply with IEEE C57.13.
  - 2. Select suitable ratio, burden, and accuracy as required for connected devices.
  - 3. Current Transformers: Connect secondaries to shorting terminal blocks.
  - 4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

## 2.03 OVERCURRENT PROTECTIVE DEVICES

- A. Circuit Breakers:
  - 1. Interrupting Capacity:
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
    - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
  - 2. Molded Case Circuit Breakers:
    - a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
    - b. Provide the following features and accessories where indicated or where required to complete installation:
      - 1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
      - 2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.

## PART 3 EXECUTION

### 3.01 EXAMINATION

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- A. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.
- B. Verify that mounting surfaces are ready to receive switchboards.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.
- C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.
- D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch (10 mm) between switchboard and wall.
- E. Provide required support and attachment components in accordance with Section 260529.
- F. Install switchboards plumb and level.
- G. Unless otherwise indicated, mount switchboards on properly sized 4 inch (100 mm) high concrete pad constructed in accordance with Section 033000.
- H. Provide grounding and bonding in accordance with Section 260526.
- I. Install all field-installed devices, components, and accessories.
- J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- K. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- L. Provide filler plates to cover unused spaces in switchboards.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 01 4010 - DSA Quality Requirements, for additional requirements.
- B. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- C. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.
- D. Inspect and test in accordance with NETA ATS, except Section 4.
- E. Perform inspections and tests listed in NETA ATS, Section 7.1.
- F. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 100 amperes. Tests listed as optional are not required.
- G. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by CEC.
  - 1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.
- H. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10.
- I. Test shunt trips to verify proper operation.
- J. Correct deficiencies and replace damaged or defective switchboards or associated components.

### 3.04 ADJUSTING

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- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of switchboard covers and doors.

### 3.05 **CLEANING**

- A. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred surfaces to match original factory finish.

### 3.06 **PROTECTION**

- A. Protect installed switchboards from subsequent construction operations.

**END OF SECTION**

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## SECTION 262816.13 ENCLOSED CIRCUIT BREAKERS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Enclosed circuit breakers.

#### 1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

#### 1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e (Amended 2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2018.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- E. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

#### 1.06 QUALITY ASSURANCE

- A. Conform to requirements of CEC.

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## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Source Limitations: Furnish enclosed circuit breakers and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

### 2.02 ENCLOSED CIRCUIT BREAKERS

- A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet (2,000 m).
  - 2. Ambient Temperature: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- D. Short Circuit Current Rating:
  - 1. Listed series ratings are acceptable, except where not permitted by motor contribution according to CEC.
  - 2. Label equipment utilizing series ratings as required by CEC.
- E. Conductor Terminations: Suitable for use with the conductors to be installed.
- F. Provide thermal magnetic circuit breakers unless otherwise indicated.
- G. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
- I. Provide externally operable handle with means for locking in the OFF position.

### 2.03 MOLDED CASE CIRCUIT BREAKERS

- A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
- B. Interrupting Capacity:
  - 1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
    - a. 14,000 rms symmetrical amperes at 480 VAC.

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2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
- C. Conductor Terminations:
  1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
- D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
- E. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and CEC.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install enclosed circuit breakers plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 260526.

#### **3.03 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers larger than 100 amperes. Tests listed as optional are not required.
- D. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

#### **3.04 CLEANING**

- A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

### **END OF SECTION**



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## SECTION 264300 SURGE PROTECTIVE DEVICES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Surge protective devices for service entrance locations.

#### 1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 262413 - Switchboards.

#### 1.03 ABBREVIATIONS AND ACRONYMS

- A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.
- B. SPD: Surge Protective Device.

#### 1.04 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- C. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 1449 - Standard for Surge Protective Devices Current Edition, Including All Revisions.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.
  - 1. SPDs with EMI/RFI filter: Include noise attenuation performance.
- C. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

#### 1.06 QUALITY ASSURANCE

- A. Conform to requirements of CEC.

#### 1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Factory-installed, Internally Mounted Surge Protective Devices:
  - 1. Same as manufacturer of equipment containing surge protective device, to provide a complete listed assembly including SPD.

#### 2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

- A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

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- B. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.

- 1. Switchboards: See Section 262413.

### 2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

- A. Unless otherwise indicated, provide factory-installed, internally mounted SPDs.
- B. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.
- C. UL 1449 Nominal Discharge Current (I-n): 20 kA.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.
- C. Verify system grounding and bonding is in accordance with Section 260526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and CEC.
- C. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 260526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.

### END OF SECTION

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## SECTION 265600 EXTERIOR LIGHTING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Exterior luminaires.
- B. Ballasts.
- C. Lamps.

#### 1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.

#### 1.03 REFERENCE STANDARDS

- A. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type) 2002.
- B. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements 2011.
- C. IEEE C2 - National Electrical Safety Code 2017.
- D. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits 2002 (Corrigendum 2012).
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- F. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems 2006.
- G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts 2016.
- H. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility 2012.
- I. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 935 - Fluorescent-Lamp Ballasts Current Edition, Including All Revisions.
- K. UL 1029 - High-Intensity-Discharge Lamp Ballasts Current Edition, Including All Revisions.
- L. UL 1598 - Luminaires Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
  - 2. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
  - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

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- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

#### 1.06 QUALITY ASSURANCE

- A. Conform to requirements of CEC.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

#### 1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

### PART 2 PRODUCTS

#### 2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

#### 2.02 LUMINAIRES

- A. Provide products that comply with requirements of CEC.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

#### 2.03 BALLASTS

- A. Ballasts/Drivers - General Requirements:
  1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

#### 2.04 LAMPS

- A. Lamps - General Requirements:
  1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
  2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
  3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.

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4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

## 2.05 POLES

### A. All Poles:

1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with CEC.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.
- B. Install products according to manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship) and NECA/IESNA 501 (exterior lighting).
- D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- E. Pole-Mounted Luminaires:
  1. Maintain the following minimum clearances:
    - a. Comply with IEEE C2.
    - b. Comply with utility company requirements.
  2. Foundation-Mounted Poles:
    - a. Install foundations plumb.
    - b. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
    - c. Tighten anchor bolt nuts to manufacturer's recommended torque.
  3. Grounding:
    - a. Bond luminaires, metal accessories, metal poles and foundation reinforcement to branch circuit equipment grounding conductor.
  4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
- F. Install accessories furnished with each luminaire.

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- G. Bond products and metal accessories to branch circuit equipment grounding conductor.
- H. Install lamps in each luminaire.

#### 3.04 **FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

#### 3.05 **ADJUSTING**

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

#### 3.06 **CLOSEOUT ACTIVITIES**

- A. See Section 017800 - Closeout Submittals, for closeout submittals.
- B. See Section 017900 - Demonstration and Training, for additional requirements.

**END OF SECTION**

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## SECTION 284600 FIRE DETECTION AND ALARM

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Fire alarm system design and installation, including all components, wiring, and conduit.
- B. Transmitters for communication with supervising station.
- C. Maintenance of fire alarm system under contract for specified warranty period.

#### 1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping: Materials and methods for work to be performed by this installer.
- B. Section 142400 - Hydraulic Elevators: Elevator systems monitored and controlled by fire alarm system.
- C. Section 211300 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.
- D. Section 233300-AirDuctAccessories: Smoke dampers monitored and controlled by fire alarm system.

#### 1.03 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits 2002 (Corrigendum 2012).
- D. California Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 72 - National Fire Alarm and Signaling Code; 2016.
- F. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

#### 1.04 SUBMITTALS

- A. See Section 01 3300 - Submittal Procedures, for submittal procedures.
- B. Proposal Documents: Submit the following with cost/time proposal:
  - 1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
  - 2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
  - 3. Certification by Contractor that the system design will comply with the contract documents.
  - 4. Proposed maintenance contract.
- C. Drawings must be prepared using AutoCAD Release 2018.
  - 1. Owner will provide floor plan drawings for Contractor's use; verify all dimensions on Owner-provided drawings.
- D. Evidence of designer qualifications.
- E. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and

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description of operation:

1. Copy (if any) of list of data required by authority having jurisdiction.
  2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
  3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
  4. System zone boundaries and interfaces to fire safety systems.
  5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
  6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
  7. List of all devices on each signaling line circuit, with spare capacity indicated.
  8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
  9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
  10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
  11. Certification by Contractor that the system design complies with the contract documents.
- F. Evidence of installer qualifications.
- G. Evidence of instructor qualifications; training lesson plan outline.
- H. Evidence of maintenance contractor qualifications, if different from installer.
- I. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
  2. Submit documentation of satisfactory inspections and tests.
  3. Submit NFPA 72 "Inspection and Test Form," filled out.
- J. Operating and Maintenance Data: See Section 01 7700 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
- K. Project Record Documents: See Section 01 7700 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
  2. "As installed" wiring and schematic diagrams, with final terminal identifications.
  3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- L. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with his installation requirements, is complete, and is in satisfactory operating condition.
  2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
  3. Maintenance contract.
  4. Provide documentation cabinet per NFPA 72.



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- M. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.
1. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.
  2. In addition to the items in quantities indicated in PART 2, furnish the following:
    - a. All tools, software, and documentation necessary to modify the fire alarm system using Owner's personnel; minimum modification capability to include addition and deletion of devices, circuits, and zones, and changes to system description, operation, and evacuation and instructional messages.
    - b. One copy, on CD-ROM, of all software not resident in read-only-memory.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
  2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
  3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
  4. Certified in the State in which the Project is located as fire alarm installer.
- B. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
- C. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

#### 1.06 WARRANTY

- A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.
- B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Fire Alarm Control Units - Basis of Design: EST3 Series
- B. Fire Alarm Control Units: Provided their products meet or exceed the performance of the basis of design product, products of the following are acceptable:
1. EST3 by Edwards.
  2. Provide all control units made by the same manufacturer.
- C. Initiating Devices, and Notification Appliances:
1. Same manufacturer as control units.
  2. Provide all initiating devices and notification appliances made by the same manufacturer.

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## 2.02 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
  - 1. Provide all components necessary, regardless of whether shown in the contract documents or not.
  - 2. Protected Premises: Entire building shown on drawings.
  - 3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
    - a. ADA Standards.
    - b. The requirements of the State Fire Marshal.
    - c. The requirements of the local authority having jurisdiction , which is DSA.
    - d. Applicable local codes.
    - e. The contract documents (drawings and specifications).
    - f. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
  - 4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
  - 5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
  - 6. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
  - 7. Program notification zones and voice messages as directed by Owner.
  - 8. Fire Command Center: Location indicated on drawings.
  - 9. Master Control Unit (Panel): New, located at fire command center.
- B. Supervising Stations and Fire Department Connections:
  - 1. Public Fire Department Notification: By remote supervising station.
  - 2. Remote Supervising Station: UL-listed central station under contract to facility.
  - 3. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.
- C. Circuits:
  - 1. Initiating Device Circuits (IDC): Class B, Style A.
  - 2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
  - 3. Signaling Line Circuits (SLC) Between Buildings: Class A, Style 2.
  - 4. Notification Appliance Circuits (NAC): Class B, Style W.
- D. Spare Capacity:
  - 1. Initiating Device Circuits: Minimum 25 percent spare capacity.
  - 2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
  - 3. Speaker Amplifiers: Minimum 25 percent spare capacity.
  - 4. Master Control Unit: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

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E. Power Sources:

1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
4. Each Computer System: Provide uninterruptible power supply (UPS).

## 2.03 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:

1. Sprinkler water control valves.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:

1. Sprinkler water flow.

C. Elevators:

1. Elevator lobby, hoistway, and machine room smoke detectors: Elevator recall for fire fighters' service.
2. Elevator Machine Room Heat Detector: Shut down elevator power prior to hoistway sprinkler activation.
3. Sprinkler pressure or waterflow: Shut down elevator power prior to hoistway sprinkler activation.

D. HVAC:

1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

## 2.04 COMPONENTS

A. General:

1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units, Initiating Devices, and Notification Appliances: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Master Control Unit: EST3.

D. Initiating Devices:

1. Addressable Systems:
  - a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
  - b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.

E. Notification Appliances:

1. Speakers:
2. Strobes:

F. Circuit Conductors: Copper or optical fiber; provide 200 feet (60 m) extra; color code and label.

G. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and CEC; except for optical fiber conductors.

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- H. Locks and Keys: Deliver keys to Owner.
  - 1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type
- I. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
  - 1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
  - 2. Provide one for each control unit where operations are to be performed.
  - 3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
  - 4. Provide extra copy with operation and maintenance data submittal.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with applicable codes, NFPA 72, CEC, and the contract documents.
- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- C. Obtain Owner's approval of locations of devices, before installation.
- D. Install instruction cards and labels.

### **3.02 INSPECTION AND TESTING FOR COMPLETION**

- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.
- H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 7 without any system or equipment malfunctions.
  - 1. Record all system operations and malfunctions.
  - 2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
  - 3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
  - 4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

### **3.03 OWNER PERSONNEL INSTRUCTION**

- A. Provide the following instruction to designated Owner personnel:
  - 1. Hands-On Instruction: On-site, using operational system.
  - 2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.

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- B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
  - 1. Initial Training: 1 session pre-closeout.
- C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
  - 1. Initial Training: 1 session pre-closeout.
- D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

### 3.04 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
  - 1. Be prepared to conduct any of the required tests. Coordinate in advance for the reprogramming of district main fire alarm panel, reprogramming by district personnel.
  - 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
  - 3. Have authorized technical representative of control unit manufacturer present during demonstration.
  - 4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
  - 5. Repeat demonstration until successful.
- B. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
  - 1. Specified diagnostic period without malfunction has been completed.
  - 2. Approved operating and maintenance data has been delivered.
  - 3. Spare parts, extra materials, and tools have been delivered.
  - 4. All aspects of operation have been demonstrated to Owner.
  - 5. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
  - 6. Specified pre-closeout instruction is complete.

### 3.05 MAINTENANCE

- A. See Section 01 7300 - Execution, for additional requirements relating to maintenance service.
- B. Provide to Owner, at no extra cost, a written maintenance contract for entire manufacturer's warranty period, to include the work described below.
- C. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
  - 1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
  - 2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
  - 3. Record keeping required by NFPA 72 and authorities having jurisdiction.
- D. Provide trouble call-back service upon notification by Owner:

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1. Provide on-site response within 2 hours of notification.
  2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
  3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.
- E. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.
- F. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.
- G. Comply with Owner's requirements for access to facility and security.

**END OF SECTION**

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## SECTION 311000 SITE CLEARING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Removal of existing debris.

#### 1.02 RELATED REQUIREMENTS

- A. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- B. Section 015713 - Temporary Erosion and Sediment Control.
- C. Section 017419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- D. Section 024100 - Demolition: Removal of built elements and utilities.
- E. Section 312323 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.
- F. Section 329300 - Plants: Relocation of existing trees, shrubs, and other plants.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Fill Material: As specified in Section 312323 - Fill and Backfill

### PART 3 EXECUTION

#### 3.01 SITE CLEARING

- A. Comply with other requirements specified in Section 017000.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

#### 3.02 EXISTING UTILITIES AND BUILT ELEMENTS

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Protect existing structures and other elements that are not to be removed.

#### 3.03 VEGETATION

- A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.
- B. Do not begin clearing until vegetation to be relocated has been removed.
- C. Preservation of existing vegetation: The construction schedule shall consider the amount and duration of soil exposed to erosion by wind, rainfall, and vehicle tracking and seek to minimize disturbed soil during the rainy season. A schedule shall be prepared that shows the sequencing of construction activities with installation of maintenance of soil stabilization and sediment control BMPs.
- D. Do not remove or damage vegetation beyond the limits indicated on drawings.
  - 1. Exception: Specific trees and vegetation indicated on drawings to be removed.
  - 2. Exception: Selective thinning of undergrowth specified elsewhere.

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- E. Install substantial, highly visible fences at least 4 feet high to prevent inadvertent damage to vegetation to remain:
  - 1. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
  - 2. Around other vegetation to remain within vegetation removal limits.
  - 3. See Section 01 5000 for fence construction requirements.
- F. Around other vegetation to remain within vegetation removal limits.
- G. See Section 015000 for fence construction requirements.
- H. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.
- I. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
  - 1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
  - 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 36 inches. Remove roots 2" in diameter and larger.
  - 3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 36 inches. Remove roots 2" in diameter and larger.
  - 4. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.
- J. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.
- K. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

#### 3.04 **DEBRIS**

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

#### **END OF SECTION**



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## SECTION 312200 GRADING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Removal of topsoil.
- B. Rough grading the site for site structures building pads and paved areas.
- C. Finish grading for planting.

#### 1.02 RELATED REQUIREMENTS

- A. Section 311000 - Site Clearing.
- B. Section 312316 - Excavation.
- C. Section 312316.13 - Trenching: Trenching and backfilling for utilities.
- D. Section 312323 - Fill: Filling and compaction.
- E. Geotechnical Engineering Report, Tokay High School New Classrooms and Gym, Lodi, California, Project No. NA185132 by Terracon Consultants, Inc. dated October 30, 2018

#### 1.03 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

#### 1.04 QUALITY ASSURANCE

- A. Perform work in accordance with the Standards Specifications for Public Works Construction (Greenbook); latest edition.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Topsoil: See Section 312323.
- B. Other Fill Materials: See Section 312323.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that survey monuments and intended elevations for the Work are as indicated.
- B. Verify the absence of standing or ponding water.

#### 3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Protect from damage above- and below-grade utilities to remain.
- D. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.
- E. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving and curbs, from damage by grading equipment and vehicular traffic.
- F. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.
- G. Protect plants, lawns, rock outcroppings and other features to remain as a portion of final landscaping.

#### 3.03 ROUGH GRADING

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- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
  - 1. Remove sod, grass, and any other vegetation before stripping top soil.
  - 2. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
  - 3. Strip topsoil in a manner to prevent intermingling with underlying subsoil or other waste materials.
  - 4. Strip topsoil to depth indicated on drawings.
- B. Do not remove topsoil when wet.
- C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- D. Do not remove wet subsoil , unless it is subsequently processed to obtain optimum moisture content.
- E. When excavating through roots, perform work by hand and cut roots with sharp axe.
- F. See Section 312323 for filling procedures.
- G. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.
- H. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.
- I. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

#### 3.04 SOIL REMOVAL

- A. Stockpile topsoil to be re-used on site; remove remainder from site.
  - 1. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water and other erosion control measures.
    - a. Limit height of topsoil stockpiles to 72 inches.
    - b. Do not stockpile topsoil within plant protection zones.
    - c. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
- B. Stockpile subsoil to be re-used on site; remove remainder from site.

#### 3.05 FINISH GRADING

- A. Before Finish Grading:
  - 1. Verify building and trench backfilling have been inspected.
  - 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 2 inch (50 mm) in size. Remove soil contaminated with petroleum products.
- C. Scarify in accordance with the Geotechnical Report and as indicated on the plans.
- D. Place topsoil in areas indicated.
- E. Place topsoil during dry weather.
- F. Remove roots, weeds, rocks, and foreign material while spreading.
- G. Near plants spread topsoil manually to prevent damage.

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- H. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- I. Lightly compact placed topsoil.
- J. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

### 3.06 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) (30 mm) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch) (13 mm).

### 3.07 REPAIR AND RESTORATION

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
- B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from a certified Arborist as to remedy.
- C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

### 3.08 FIELD QUALITY CONTROL

- A. See Section 312323 for compaction density testing.

### 3.09 CLEANING

- A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.

**END OF SECTION**

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## SECTION 312316 EXCAVATION

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Excavating for footings, slabs-on-grade, paving, site structures and utilities within the building.
- B. Trenching for utilities outside the building .

#### 1.02 RELATED REQUIREMENTS

- A. Section 015713 - Temporary Erosion and Sedimentation Control: Slope protection and erosion control.
- B. Section 017000 - Execution and Closeout Requirements: General requirements for dewatering of excavations and water control.
- C. Section 312200 - Grading
- D. Section 312316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.
- E. Section 312323 - Fill

**PART 2 PRODUCTS - NOT USED** See Geotechnical Engineering Report, Tokay High School New Classrooms and Gym, Lodi, California, Project No. NA185132 by Terracon Consultants, Inc. dated October 30, 2018

### PART 2 PRODUCTS - NOT USED

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that survey monuments and intended elevations for the work are as indicated.

#### 3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Locate, identify, and protect utilities that remain and protect from damage.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving and curbs from excavating equipment and vehicular traffic.
- D. Protect plants, lawns, rock outcroppings and other features to remain.
- E. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Architect.

#### 3.03 EXCAVATING

- A. Excavate to accommodate new structures and construction operations.
- B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Notify the Geotechnical Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- D. Do not interfere with 45 degree bearing splay of foundations.
- E. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- F. If excavated material is to be re-used as fill, stockpiling of soil must be in an area designated for stockpiling on site in accordance with Section 312200.

#### 3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.

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- B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

### 3.05 **PROTECTION**

- A. Divert surface flow from rains or water discharges from the excavation.
- B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.
- D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- E. Keep excavations free of standing water and completely free of water during concrete placement.

**END OF SECTION**

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## SECTION 312316.13 TRENCHING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Excavating, backfilling and compacting for utilities outside the building to point of connection with public and/or private utility mains.

#### 1.02 RELATED REQUIREMENTS

- A. Section 312200 - Grading: Site grading.
- B. Section 312316 - Excavation: Building and foundation excavating.
- C. Section 312323 - Fill: Backfilling at building and foundations.
- D. Geotechnical Engineering Report, Tokay High School New Classrooms and Gym, Lodi, California, Project No. NA185132 by Terracon Consultants, Inc. dated October 30, 2018

#### 1.03 REFERENCES

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop 2018.
- B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates 2014.
- C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)) 2012, with Editorial Revision (2015).
- D. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method 2007.
- E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)) 2012, with Editorial Revision (2015).
- F. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method 2015.
- G. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) 2017.
- H. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth) 2005.
- I. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils 2017, with Editorial Revision (2018).
- J. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth) 2017a.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Samples: 10 lb (4.5 kg) sample of each type of fill; submit in air-tight containers to the District's testing laboratory.
- C. Materials Sources: Submit name of imported materials source.
- D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- E. Compaction Density Test Reports.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.

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- B. When fill materials need to be stored on site, locate stockpiles where allowed by the Owner's representative.
  - 1. Protect stockpiles from erosion and deterioration of materials.

## **PART 2 PRODUCTS**

### **2.01 FILL MATERIALS**

- A. Backfill above Pipe Bedding: Controlled Low-Strength Material, CLSM, per Caltrans Section 19-3.02G.
- B. Granular Fill- Pea Gravel: Natural stone; washed, free of clay, shale, organic matter.
  - 1. Graded in accordance with ASTM C136/C136M, within the following limits:
    - a. Minimum Size: 1/4 inch (6 mm).
    - b. Maximum Size: 5/8 inch (16 mm).
- C. Sand: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.
  - 1. Graded in accordance with ASTM C136/C136M; within the following limits:
    - a. No. 4 (4.75 mm) sieve: 100 percent passing.
    - b. No. 14 (1.40 mm) sieve: 10 to 100 percent passing.
    - c. No. 50 (300 micro m) sieve: 5 to 90 percent passing.
    - d. No. 100 (150 micro m) sieve: 4 to 30 percent passing.

### **2.02 ACCESSORIES**

- A. Geotextile Fabric: Non-biodegradable, woven Mirafi ; 140N manufactured by Mirafi.

### **2.03 SOURCE QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that survey monuments and intended elevations for the work are as indicated.

### **3.02 PREPARATION**

- A. Identify required lines, levels, contours, and datum locations.
- B. Locate, identify, and protect utilities that remain and protect from damage.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving and curbs from excavating equipment and vehicular traffic.
- D. Protect plants, lawns, rock outcroppings and other features to remain.
- E. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Architect.
- F. Protect existing trees and tree roots. Trenching under the dripline of existing trees shall be performed by hand using hand tools.

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### 3.03 TRENCHING

- A. Notify the Geotechnical Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- B. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Cut trenches wide enough to allow inspection of installed utilities.
- E. Hand trim excavations. Remove loose matter.
- F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.
- G. Remove excavated material that is unsuitable for re-use from site.
- H. Stockpile excavated material to be re-used in area designated in Section 312200.
- I. Remove excess excavated material from site.
- J. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- K. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot (305 mm) into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect.
- L. Trenching under the dripline of existing trees shall be performed by hand using hand tools only. Contractor shall not cut or damage existing roots unless approved by a certified Arborist.

### 3.04 PREPARATION FOR UTILITY PLACEMENT

- A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

### 3.05 BACKFILLING

- A. Backfill to elevations indicated using unfrozen materials.
- B. Fill up to subgrade elevations unless otherwise indicated.
- C. Employ a placement method that does not disturb or damage other work.
- D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Correct areas that are over-excavated.
  - 1. Thrust bearing surfaces: Fill with concrete.
  - 2. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.
- G. Reshape and re-compact fills subjected to vehicular traffic.

### 3.06 TOLERANCES

- A. Top Surface of General Backfilling: Plus or minus 1 inch (25 mm) from required elevations.

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- B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch (25 mm) from required elevations.

### 3.07 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167 or ASTM D6938.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180 or ASTM D698 ("standard Proctor").
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Frequency of Tests: One test per every 100 feet of trench, or as required by the Geotechnical Engineer..

### 3.08 CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

**END OF SECTION**

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## SECTION 312323 FILL

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Filling, backfilling, and compacting for footings, slabs-on-grade, paving and site structures.
- B. Backfilling and compacting for utilities outside the building to utility main connections.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

#### 1.02 RELATED REQUIREMENTS

- A. Section 015713 - Temporary Erosion and Sediment Control: Slope protection and erosion control.
- B. Section 033000 - Cast-in-Place Concrete.
- C. Section 312200 - Grading: Site grading.
- D. Section 312316 - Excavation: Removal and handling of soil to be re-used.
- E. Section 312316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.
- F. Geotechnical Engineering Report, Tokay High School New Classrooms and Gym, Lodi, California, Project No. NA185132 by Terracon Consultants, Inc. dated October 30, 2018

#### 1.03 REFERENCE STANDARDS

- A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses 2017.
- B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop 2018.
- C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates 2014.
- D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)) 2012, with Editorial Revision (2015).
- E. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method 2007.
- F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)) 2012, with Editorial Revision (2015).
- G. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils 2017, with Editorial Revision (2018).
- H. Standard Specifications, California State Department of Transportation (Caltrans), latest edition.
- I. Standard Specifications for Public Works Construction (the "Greenbook"), latest edition.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Materials Sources: Submit name of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
- D. Compaction Density Test Reports.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. When fill materials need to be stored on site, locate stockpiles where designated.

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1. Protect stockpiles from erosion and deterioration of materials.

## **PART 2 PRODUCTS**

### **2.01 FILL MATERIALS**

- A. General Fill: Stripped topsoil or expansive soil with clay usable in landscape or non-structural areas.
  1. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm), and debris.
- B. Engineered Fill: Structural fill conforming to the requirements of the Geotechnical Report, and as indicated on the plans.
  1. Non-expansive (no clay) fill material, suitable for structural areas, with less than 3% organics by volume, and free of debris and fragments greater than 6 inches in maximum dimension, and not more than 15% larger than 2.5 inches.
  2. Percent passing No. 200 sieve: 15% to 50%.
  3. Plasticity Index (PI): 10% maximum
  4. Expansion Index: 20% maximum
  5. Clean sand or very sandy soil is not acceptable.
- C. Aggregate Base: Per the requirements of Section 32 11 23.
- D. Concrete for Backfill of Structures: Slurry cement per Caltrans Section 19-3.02E, 1000 psi compressive strength, minimum. Acceptable as structural Engineered Fill.
- E. Concrete for Backfill of Utility Trenches: Controlled Low-Strength Material, CLSM, per Caltrans Section 19-3.02G for bedding of storm drainage or sanitary sewer pipes, 100 psi compressive strength, minimum.
- F. Granular Fill- Pea Gravel : Natural stone; washed, free of clay, shale, organic matter.
  1. Graded in accordance with ASTM C136/C136M, within the following limits:
    - a. Minimum Size: 1/4 inch (6 mm).
    - b. Maximum Size: 5/8 inch (16 mm).
- G. Sand: Per the requirements of Section 31 23 13.16.
- H. Drain rock: Hard, durable, clean crushed stone, free of organic matter and other deleterious substances.
  1. Graded in accordance within the following limits:
    - a. 1 inch (25 mm) sieve: 100 percent passing.
    - b. 3/4 inch (19 mm) sieve: 80 to 100 percent passing.
    - c. 1/2 inch (12 mm) sieve: 10 to 20 percent passing.
    - d. 3/8 inch (9 mm) sieve: 0 to 10 percent passing.
    - e. No. 4 (4.75 mm) sieve: 0 to 7 percent passing.
    - f. No. 200 (75 micro m) sieve: 0 to 1 percent passing.

### **2.02 ACCESSORIES**

- A. Geotextile Fabric: Non-biodegradable, woven Mirafi ; 140N manufactured by Mirafi.
- B. Vapor Retarder: 10 mil (0.25 mm) thick, polyethylene.

### **2.03 SOURCE QUALITY CONTROL**

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- A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that survey bench marks and intended elevations for the Work are as indicated.
- B. Identify required lines, levels, contours, and datum locations.
- C. See Section 312200 for additional requirements.
- D. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
- E. Verify structural ability of unsupported walls to support imposed loads by the fill.
- F. Verify areas to be filled are not compromised with surface or ground water.

### **3.02 PREPARATION**

- A. Scarify the site in accordance with the Geotechnical Report and as indicated on the plans.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

### **3.03 FILLING**

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Fill up to subgrade elevations unless otherwise indicated.
- C. Employ a placement method that does not disturb or damage other work.
- D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches (200 mm) compacted depth.
- G. Slope grade away from building minimum 2 inches in 10 feet (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- H. Correct areas that are over-excavated.
  - 1. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 90 to 95 percent of maximum dry density.
  - 2. Other areas: Use general fill, flush to required elevation, compacted to minimum 90 percent of maximum dry density.
- I. Compaction Density Unless Otherwise Specified or Indicated:
  - 1. Under paving, slabs-on-grade and similar construction: 90 to 95 percent of maximum dry density as indicated in the Geotechnical Report, "Earthwork".
  - 2. At landscaped areas: 90 percent of maximum dry density.
- J. Reshape and re-compact fills subjected to vehicular traffic.

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- K. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

#### 3.04 TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1 inch (25 mm) from required elevations.
- B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch (25 mm) from required elevations.

#### 3.05 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor").
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- D. Frequency of Tests: As required by the Geotechnical Engineer..
- E. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

#### 3.06 CLEANING

- A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

**END OF SECTION**

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## SECTION 320190 OPERATION AND MAINTENANCE OF PLANTING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Maintain plants in manner that promotes health, growth, color and appearance, to quality levels specified; replace dead, dying, and damaged plants at no extra cost to Owner.
  - 1. It is Contractor's responsibility to determine type and quantity of soil amendments and fertilizer required.
  - 2. Perform soil analysis to determine type and quantity of soil amendments; test enough soil samples to obtain a comprehensive analysis; submit reports.
- B. Maintain newly planted landscape plants, including trees, shrubs, vines, ground cover and perennials.
- C. Maintain established landscape plants, including turf (lawns), trees, shrubs and hedges.
- D. Clean up landscaped areas.
- E. Maintenance Period: The time frame covered by these requirements is 90 days:
  - 1. Start Date: Project Date of Substantial Completion.

#### 1.02 RELATED REQUIREMENTS

- A. Section 015713 - Temporary Erosion and Sediment Control.
- B. Section 312200 - Grading.
- C. Section 329300 - Plants.

#### 1.03 REFERENCE STANDARDS

- A. ANSI A300 Part 1 - American National Standard for Tree Care Operations -- Tree, Shrub and Other Woody Plant Maintenance -- Standard Practices 2017.
- B. ANSI Z133.1 - American National Standard For Arboricultural Operations - Pruning, Repairing, Maintaining, And Removing Trees, And Cutting Brush - Safety Requirements 2012.
- C. ASTM C602 - Standard Specification for Agricultural Liming Materials 2013a.
- D. ASTM D4972 - Standard Test Method for pH of Soils 2018.
- E. ASTM D5883 - Standard Guide for Use of Rotary Kiln Produced Expanded Shale, Clay or Slate (ESCS) as a Mineral Amendment in Topsoil Used for Landscaping and Related Purposes 2018.

#### 1.04 PROPOSAL SUBMITTALS

- A. Submit complete maintenance plan, showing:
  - 1. Irrigation volume and frequency.
  - 2. Fertilizer type, quantity, and schedule of application.
  - 3. Soil amendment type, quantity, and schedule of application.
  - 4. Personnel assigned, including supervisor.
  - 5. Inspection procedures, diagnostics, and remedies.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Soil Tests and Analysis: Submit report showing number of samples, test results, and recommendations for soil amendments and fertilizer.

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- C. Product Data: Manufacturer's data sheets on each fertilizer, herbicide, pesticide, and other chemical material to be used, showing trade name, chemical composition, mixing instructions, recommended application rate, storage and handling instructions, and application instructions.
  - 1. Pesticides and Herbicides: Also include U.S. EPA registration number and Material Safety Data Sheets.
- D. Shop Drawings:
  - 1. Maintenance plan.
  - 2. Recommendations of the local Cooperative Extension Service office for maintenance and care of turf.
  - 3. Pesticide application plan; obtain approval of Owner for each individual pesticide application.
- E. Certificates: Certification of composition of the following as delivered:
  - 1. Fertilizer.
  - 2. Mulch.
  - 3. Pesticides.
  - 4. Herbicides.
- F. Installer Qualifications: As specified.

#### 1.06 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Maintenance Contractor: The contractual entity that performed the planting installation.
  - 2. Pruners: Certified member, or supervised by certified member, of International Society of Arboriculture.
  - 3. Pesticide Applicators: Certified by authorities having jurisdiction.
  - 4. Herbicide Applicators: Certified by authorities having jurisdiction.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver U.S. EPA-controlled materials to site in original containers with legible labels indicating registration number and registered uses.
- B. Deliver fertilizer and manufactured soil amendments to site in original containers bearing manufacturer's chemical analysis, name, trade name or trademark, and indication of compliance with applicable state and federal laws and regulations ; alternatively, bulk delivery with equivalent certificate is acceptable.
- C. Store fertilizer, soil amendments, and mulch in dry locations away from contaminants.
- D. Do not store pesticides, herbicides, or other chemical treatment materials in locations where they could damage seeds or plants.

### PART 2 PRODUCTS

#### 2.01 FERTILIZERS AND SOIL AMENDMENTS

- A. Fertilizers: Free flowing granular organic type containing nitrogen, phosphorus, and potassium, plus trace minerals and micro-nutrients; controlled release type is preferred.
  - 1. Determine type and quantity based on soil analysis.type and quanties below are for cost purposes only. It shall be the contractor's responsibility to test furnish a third party ,site specifi soil analysis and prepare soil per the recommendation of that report

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- B. Soil Amendments: Type and quantity as required to achieve specified results, based on soil analysis.

## 2.02 APPLIED MATERIALS

- A. Organic Mulch: Maintain general appearance of existing mulched areas; use one of the following types:
  1. Republic Service's "Pro-Chip" mulch for non-bioretnition planting areas.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. If soil analysis has not already been performed, take sufficient samples to obtain a comprehensive analysis; perform analysis in accordance with ASTM D4972.

### 3.02 LANDSCAPE MAINTENANCE - GENERAL

- A. Protect existing vegetation, pavements, and facilities from damage due to maintenance activities; restore damaged items to original condition or replace, at no extra cost to Owner.
- B. General Cleanup: Remove debris from all landscape areas at least once a week and from turf areas before each mowing.
  1. Debris consists of trash, rubbish, dropped leaves, downed branches and limbs of all sizes, dead vegetation, rocks, and other material not belonging in landscaped areas.
  2. Remove debris from site and dispose of properly.
- C. Watering, Soil Erosion, and Sedimentation Control: Comply with federal, state, local, and other regulations in force; prevent over-watering, run-off, erosion, puddling, and ponding.
  1. Repair temporary erosion control mechanisms provided by others.
  2. Repair eroded areas and replant, when caused by inadequate maintenance.
  3. Prevent sediment from entering storm drains.
- D. Trees: Exercise care to avoid girdling trees; provide protective collars if necessary; remove protective collars at end of maintenance period.
- E. Fertilizing: Apply fertilizer only when necessary.
- F. Drainage Channels: Remove obstructions in gutters, catch basins, storm drain inlets, yard drains, swales, ditches, and overflows.
  1. Remove grates from catch basins to clean.
  2. Prevent encroachment of other vegetation on turfed surface drainage channels.
- G. Health Maintenance: Inspect all plants regularly for health:
  1. Eradicate diseases and damaging pests, regardless of severity or speed of effect.
  2. Treat accidental injuries and abrasions.
  3. If a plant is unhealthy but not yet dead, according to specified definitions, determine reason(s) and take remedial action immediately.
  4. Remove dead plants immediately upon determining that they are dead.
- H. Pesticide and Herbicide Application: Comply with manufacturer's instructions and recommendations and applicable regulations.
  1. Obtain Owner's approval prior to each application.
  2. Apply in manner to prevent injury to personnel and damage to property due to either direct spray or drifting, both on and off Owner's property.
  3. Use backflow preventers on hose bibbs used for mixing water; prevent spills.



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4. Inspect equipment daily before application; repair leaks, clogs, wear, and damage.
5. Do not dispose of excess mixed material, unmixed material, containers, residue, rinse water, or contaminated articles on site; dispose of off site in legal manner.
6. Rinse water may be used as mix water for next batch of same formulation.
7. Contractor is responsible for all recordkeeping, submissions, and reports required by laws and regulations.

I. Replanting: Perform replacement and replanting immediately upon removal of dead plant.

### 3.03 IRRIGATION

A. Irrigation: Do not allow plants to wilt; apply water as required to supplement rainfall; do not waste water; do not water plants or areas not needing water; do not water during rainfall; shut off water flow when finished; repair leaks.

1. Provide backflow preventers on hose bibbs used for irrigation hoses.

### 3.04 PLANTING BED MAINTENANCE

- A. Planting beds include all planted areas except turf.
- B. Begin maintenance immediately after plants have been installed; inspect at least once a week and perform needed maintenance promptly.
- C. Keep planting beds free of pests; remove weeds and grass by hand before reaching 1 inch (25 mm) height.
- D. Do not allow climbing, twining, or creeping plants to encroach into other species.
- E. Replace mulch as required and remove debris.

### 3.05 TREE AND SHRUB MAINTENANCE

- A. Trees will be considered dead when main leader has died back or when 25 percent or more of crown has died ; except as otherwise indicated for palm trees.
- B. Shrubs will be considered dead when 25 percent or more of plant has died.
- C. Inspect woody plants for health by scraping up to 1/16 inch (2 mm) square area of bark; no green cambium layer below bark shall be evidence of death.
- D. Adjust stakes, guys and turnbuckles, ties, and trunk wrap as required to promote growth and avoid girdling.
- E. Pruning: Unless otherwise indicated, prune only to maintain balanced natural shape; follow recommendations of ANSI A300 and ANSI Z133.1 and best local practices for species involved.
- F. Shrubs: Prune at least once during maintenance period at best time to influence ultimate shape and size for the particular species.
  1. Prune to balance the plant's form and according to its natural growth characteristics.
  2. Remove water shoots, suckers, and branches not conforming to desired shape and size.
- G. Hedges: Trim to encourage growth into voids and gaps.

### 3.06 CLEANING

- A. Remove fallen deciduous leaves in Fall; removal may wait until all leaves have fallen.
- B. Clean adjacent pavements of plant debris and other debris generated by maintenance activities.
- C. Remove and dispose of general cleanup debris and biodegradable debris in a proper manner; Owner's trash collection facilities may be used.

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D. Remove and dispose of general cleanup debris and biodegradable debris in a proper manner.

1. Biodegradable Debris: Owner will designate a compost pile on site where biodegradable debris may be deposited; branches and bark are not considered biodegradable.
2. Branches and Bark: Owner will designate a wood chip storage area; machine-chip all branch and bark debris.
3. Non-Biodegradable Debris: Owner's trash collection facilities may be used.

### 3.07 CLOSEOUT ACTIVITIES

- A. 10 days prior to end of maintenance period, submit request for final inspection.

**END OF SECTION**

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## SECTION 321123 AGGREGATE BASE COURSES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Aggregate base course.

#### 1.02 RELATED REQUIREMENTS

- A. Section 312200 - Grading: Preparation of site for base course.
- B. Section 312316.13 - Trenching: Compacted fill over utility trenches under base course.
- C. Section 312323 - Fill: Compacted fill under base course.
- D. Section 321216 - Asphalt Paving: Finish and binder asphalt courses.
- E. Section 321313 - Concrete Paving: Finish concrete surface course.
- F. Section 330513 - Manholes and Structures: Manholes including frames.

#### 1.03 REFERENCE STANDARDS

- A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses 2017.
- B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop 2018.
- C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates 2014.
- D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)) 2012, with Editorial Revision (2015).
- E. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method 2007.
- F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)) 2012, with Editorial Revision (2015).
- G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method 2015.
- H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) 2017.
- I. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth) 2017a.
- J. Standard Specification of the State of California (Caltrans), latest edition.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Materials Sources: Submit name of imported materials source.
- C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. When aggregate materials need to be stored on site, locate where directed by Owner.
- B. Aggregate Storage, General:

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1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Aggregate Base: 3/4" Class 2 conforming to Caltrans Section 26 with a minimum R-value of 78.

### **2.02 SOURCE QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.
- B. Where aggregate materials are specified using ASTM D2487 classification, testing of samples for compliance will be provided before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that survey bench marks and intended elevations for the work are as indicated.
- B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

### **3.02 PREPARATION**

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.

### **3.03 INSTALLATION**

- A. Spread aggregate over prepared substrate to a total compacted thickness as indicated on plans.
- B. Place aggregate in maximum 4 inch (100 mm) layers and roller compact to specified density.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

### **3.04 TOLERANCES**

- A. Flatness: Maximum variation of 1/4 inch (6.4 mm) measured with 10 foot (3 m) straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch (6.4 mm).
- C. Variation From Design Elevation: Within 1/2 inch (12.8 mm).

### **3.05 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.

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- B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556, ASTM D2167 or ASTM D6938.
- C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D698 ("standard Proctor") or ASTM D1557 ("modified Proctor").
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade.

### 3.06 **CLEANING**

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

**END OF SECTION**

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## SECTION 321216 ASPHALT PAVING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Single course bituminous concrete paving.
- B. Surface sealer.

#### 1.02 RELATED REQUIREMENTS

- A. Section 312200 - Grading: Preparation of site for paving and base.
- B. Section 321123 - Aggregate Base Courses: Aggregate base course.
- C. Section 321313 - Concrete Paving
- D. Section 330513 - Manholes and Structures: Manholes, including frames; gutter drainage grilles, covers, and frames for placement by this section.

#### 1.03 REFERENCE STANDARDS

- A. AI MS-2 - Asphalt Mix Design Methods 2015.
- B. AI MS-19 - Basic Asphalt Emulsion Manual 2008.
- C. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction 2009a.
- D. Standard Specifications of the State of California (Caltrans), latest edition.

#### 1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with the State of California (Caltrans), latest edition.
- B. Mixing Plant: Conform to the State of California (Caltrans), latest edition.
- C. Obtain materials from same source throughout.

#### 1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for paving work on public property.

#### 1.06 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

#### 1.07 FIELD CONDITIONS

- A. Do not place asphalt when ambient air or base surface temperature is less than 50 degrees F, or surface is wet or frozen.
- B. Place bitumen mixture when temperature is not more than 15 F degrees (8 C degrees) below bitumen supplier's bill of lading and not more than maximum specified temperature.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Asphalt Concrete: Caltrans Specifications, Section 39, Type A, 1/2 inch hot mix.
- B. Tack Coat: Emulsified asphalt.
- C. Seal Coat: Caltrans Specifications, Section 37 Provide Park-Top No. 302 manufactured by Western Colloid Products.
- D. Soil Sterilizer: Pramitol 25-E by CIBA CEIGY.
- E. Pavement Epoxy: Ktepox-590 by K-Lite.
- F. Crack Filler:

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1. Cracks up to 1/2": CAR08 by QPR
2. Cracks 1/4" to 1": Docal 1100 Viscolastic by Conoco Inc.
3. Cracks greater than 1": Hot Mix by Topeka

## 2.02 ASPHALT PAVING MIXES AND MIX DESIGN

- A. Submit proposed mix design of each class of mix for review prior to beginning of work.

## 2.03 SOURCE QUALITY CONTROL

- A. Test mix design and samples in accordance with [\_\_\_\_\_].

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

### 3.02 PREPARATION - TACK COAT

- A. Apply tack coat in accordance with manufacturer's instructions.
- B. Apply tack coat in accordance with Greenbook, Section 302-5.4.
- C. Apply tack coat to contact surfaces of curbs, gutters and existing pavements.

### 3.03 PLACING ASPHALT PAVEMENT - SINGLE COURSE

- A. Install Work in accordance with the State of California (Caltrans), latest edition.
- B. Place asphalt within 24 hours of applying primer or tack coat.
- C. Place to a maximum thickness of 4 inches.
- D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

### 3.04 SEAL COAT

- A. Apply seal coat to surface course and asphalt curbs in accordance with Caltrans Specifications Section 37.

### 3.05 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch (6 mm) measured with 10 foot (3 m) straight edge.
- B. Compacted Thickness: Within 1/4 inch (6 mm) of specified or indicated thickness.
- C. Variation from Tru Elevation: Within 1/4 inch (6 mm).

### 3.06 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for quality control.
- B. Provide field inspection and testing. Take samples and perform tests in accordance with [\_\_\_\_\_].

### 3.07 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury for 14 days or until surface temperature is less than 140 degrees F (60 degrees C).

**END OF SECTION**

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## SECTION 321313 CONCRETE PAVING

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Driveways.
- B. Roadways.
- C. Parking lots.
- D. Curbs and gutters.
- E. Walks.
- F. Mow strips.
- G. Wheel stops.
- H. Pavement marking paint.
- I. Detectable warnings.

#### 1.02 RELATED REQUIREMENTS

- A. Division 03 Section Cast-in-Place Concrete
- B. Division 05 Section Metal Fabrications
- C. Division 05 Section Pipe and Tube Railings.
- D. Division 05 Section Decorative Metal Railings
- E. Division 31 Section Earthwork
- F. Division 32 Section Architectural Site Concrete
- G. Division 32 Section Concrete Paving Joint Sealants
- H. Division 32 Section Chain Link Fences and Gates
- I. Division 32 Section Decorative Metal Fences and Gates

#### 1.03 PREINSTALLATION CONFERENCE

- A. Conduct conference at Project site two weeks prior to start of work of this section. Required attendance of all affected installers.
  - 1. Review methods and procedures related to concrete paving, including but not limited to, the following:
  - 2. Concrete mixture design
  - 3. Testing and inspection procedures.
  - 4. Concrete finishes and finishing.
  - 5. Cold- and hot-weather concreting procedures.
  - 6. Curing procedures.
  - 7. Construction joints.
  - 8. Forms and form-removal limitations.
  - 9. Reinforcement accessory installation.
  - 10. Concrete repair procedures.
  - 11. Protection of cast-in-place architectural site concrete.
  - 12. Review special testing and inspection procedures.



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13. Placement sequence and schedule.
14. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
  - a. Contractor's superintendent.
  - b. Independent testing agency responsible for concrete design mixtures.
  - c. Ready-mix concrete manufacturer.
  - d. Concrete paving subcontractor.
  - e. District's Representative
  - f. Architect's Representative
  - g. Inspector of Record
  - h. Manufacturer's representative for specialty concrete paving finishes.
  - i. Provide meeting minutes for pre-installation conference

#### 1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
  1. Proprietary admixtures, pigments, curing compounds, hardeners, sealers, form-release agents, etc.: Indicate compatibility with other materials used.
  2. Stenciling material
- B. Samples for Initial Selection: For each type of product, finish, ingredient, or admixture requiring color selection.
  1. Submit full range of manufacturer's standard and custom range of colors and products for review and selection. Provide custom colors on samples as required. Upon selection of color, submit 12"x12" sample of material in the specified color finish for review by Landscape Architect in addition to the specified mock ups.
  2. Stencil Shop Drawing submittal to Architect for approval is required before mock up work for stenciling is to begin.
  3. Wheel Stops: 6 - 7 inches wide in cross section; with fasteners.
- C. Design Mixtures: Submit proposed mix designs and test data for each class of concrete and for each method of placement.
  1. Prepare mix designs on the basis of field experience (preferred) and/or trial mixes, in compliance with California Building Code (CBC), Section 1905A and ACI 318
  2. Mix designs shall be prepared, stamped and signed by a structural or civil engineer registered in the State of California.
    - a. Mix designs shall be reviewed by the Architect (AOR) and Structural Engineer of Record (SEOR).
  3. Identify for each mix design submitted the method by which proportions have been selected.
    - a. For mix designs based on field experience, include individual strength test results, standard deviation, and required average compressive strength  $f'_c$  calculations.
    - b. For mix designs based on trial mixtures, include trial mix proportions, test results, graphical analysis and show required average compressive strength  $f'_c$  results. Provide gross weight and yield per cubic yard of trial mixes.
    - c. Indicate quantity of each ingredient per cubic yard of concrete and percentages.
    - d. Indicate type and quantity of admixtures proposed or required.

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- e. Indicate water to cement ratio by weight.
  - f. Measured slump.
  - g. Measured air content.
  - h. Provide shrinkage test results.
4. Multiple mix designs or multiple manufacturers shall not be permitted for the same application.
- D. Mix designs should contain no fly ash.
  - E. Submit proposed alternate design mixtures for review by the Architect and SEOR when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - F. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Shop drawings should include details such as reveals, recessed lights, handrails, or other elements requiring steel coordination.
    1. Coordinate with and identify the details of the Contract Drawings on the shop drawings.
    2. Comply with ACI 315, part B and CRSI requirements.
  - G. Construction Joint Layout: Indicate proposed construction joints required to construct the structure. Submit dimensioned drawing indicating layout of construction joints, contraction (control) joints, dowelled joints, decorative scoring and placement sequence of concrete if different than layout indicated on plans.
    1. Location of construction joints are subject to approval of the Architect.
    2. All form seams are to align with construction joints or reveals.
  - H. Placement Schedule: Submit concrete placement schedule before start of placement operations. Include locations of all joints including construction joints.
  - I. Pavement-Marking Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
  - J. Qualification Data: For qualified ready-mix concrete manufacturer (batch plant) and installer of detectable warnings.
  - K. Welding Certificates: Submit certifications signed by AWS Certified Welding Inspector of prequalified welding procedures, qualifications of welding procedures unless prequalified, qualifications of welding operators and qualifications of welders.
  - L. Material Certificates: For the following, submit manufacturer data, test results, and technical information for aggregate, sand and cement, submit ½ cubic foot physical sample. For sealant submit manufacturer color standard and custom palette together with physical samples:
    1. Cementitious materials.
    2. Aggregates and sand.
    3. Steel reinforcement and reinforcement accessories.
    4. Fiber reinforcement.
    5. Admixtures.
    6. Curing compounds.

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7. Applied finish materials.
8. Bonding agent and epoxy adhesives.
9. Joint fillers.
10. Sealer
11. Sealant.
12. Pigments.

M. Material Test Reports: For each of the following:

1. Aggregates. Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

N. Detectable Warning Device Warranty: Submit copies of manufacture's five year warranty for each of these products and manufacturer custom and standard color palette.

O. Field quality-control reports.

1. Submit copies of delivery tickets complying with ASTM C 94 for each load of concrete delivered to the site. Tickets shall include all information required by the referenced standard.

P. Minutes of pre-installation conference.

#### 1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with CBC Chapter 19A.

1. Chemical products field-applied to concrete shall comply with the air quality requirements of authorities having jurisdiction.
2. Comply with requirements of local, State and other authorities having jurisdiction for work performed within public right-of ways.

B. Chemical products field-applied to concrete shall comply with the air quality requirements of authorities having jurisdiction.

C. Comply with requirements of local, State and other authorities having jurisdiction for work performed within public right-of ways.

D. Industry Standards: Comply with the following unless modified by requirements in the Contract Documents.

1. ACI 301, "Specifications for Structural Concrete".
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials".
3. ACI 302.1R, "Guide for Concrete Floor and Slab Construction".
4. ACI 304R, "Guide for Measuring, Mixing, Transporting, and Placing Concrete".
5. ACI 305R, "Hot Weather Concreting".
6. ACI 306.1, "Standard Specification for Cold Weather Concreting".
7. ACI 318, "Building Code Requirements for Structural Concrete".
8. ACI 347, "Guide to Formwork for Concrete".
9. ACI SP-66, "ACI Detailing Manual".
10. CRSI, "Manual of Standard Practice".
11. CRSI, "Placing Reinforcing Bars".

E. Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of cast-in-place, surface-applied unit-paver-type detectable truncated dome products.

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- F. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").
- G. Source Limitations for Concrete Paving: Obtain each color, size, type, and variety of concrete material and concrete mixture from single manufacturer with resources to provide concrete of consistent quality in appearance and physical properties. Secure all material required for the duration of the project as needed to ensure consistent quality in appearance.
- H. Welding Qualifications: Comply with CBC Chapter 17A.
  - 1. Qualify welding procedures and welding personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel" prior to performing any welding.
  - 2. Qualify welding inspection personnel according to AWS QC1, "Standard for AWS Certification of Welding Inspectors."
- I. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.
- J. ACI Publications: Comply with ACI 301 unless otherwise indicated.
- K. Mockups: Before casting concrete paving, build mockups to verify selections made under Sample submittals and to fully demonstrate typical joints (including expansion and saw cut joints), surface finish, texture, color tolerances, standard of workmanship and completed product. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
    - a. Paving Modules: Construct at least one 6 ft. x 6 ft. mockup of each color, finish, and mix design of special paving module, including stenciled areas, banding and curbs
    - b. Radial Paving Patterns: Construct at least one 180 sq. ft. mockup of curved or radial paving patterns.
    - c. Abrasive-Blast Finishes: Mockups shall clearly demonstrate 3 levels of depth of cut for abrasive-blast finishes for Architect's review.
    - d. Stairs: Construct minimum 2 risers and treads X 4' long with nosing grooves and stained color within grooves for each color and finish specified.
    - e. Mow Strip: minimum 6' long for each specified width and color.
    - f. Stenciled Letters or Graphics: minimum 4 letters and one full size graphic for each size, font setting and finish. Mock up to be set on concrete pavement or wall matching conditions of final install.
    - g. Truncated Domes: minimum 3'X6' long set in concrete with concrete base and grout.
    - h. Repairs: In presence of Architect, damage part of the exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes, honeycombing, spalls, surface blemishes, etc. to match adjacent undamaged surfaces.

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2. Build mockups full-size, matching site concrete components indicated on the Drawings. Mock-ups shall be complete in every detail, including joints, reveals, edges, chamfers, etc. Include complex joinery conditions where necessary to integrate to other Project components as indicated including multiple pour conditions. Mockups should be provided for each finish, color, joint and detail specified.
3. Maintain accurate records of variables associated with each mockup to facilitate the matching of accepted mockups during actual construction.
4. Demonstrate curing, cleaning, and protecting of cast-in-place concrete paving, finishes, and contraction and expansion joints, as applicable.
5. Mockup Acceptance: Obtain Architect's approval of mockups before casting architectural site concrete and paving.
  - a. The Architect may reject mockups that, in the Architect's sole judgment, do not demonstrate an acceptable completed product, including, but not limited to, color, joint work, surface finish, texture, tolerances, and standard of workmanship
  - b. The Architect may require modifications to mockups to obtain acceptable results.
  - c. The Architect may require modifications to mockup repairs to obtain acceptable results.
  - d. The Architect may require removal and reconstruction of mockups to obtain acceptable results. Multiple mock ups maybe required.
  - e. Contractor shall provide additional mockups as required to obtain results acceptable to the Architect at no additional cost to the Owner.
6. Mockup Disposition: Accepted mockups shall not become part of the completed Project. Maintain mockup onsite for the duration of construction and until all work has been accepted. Remove and legally dispose mockups after acceptance of final installed work. prior to Project Completion. If sufficient permanent concrete paving work has been completed, Contractor may submit a written request to Architect to transfer quality control for concrete paving from the accepted mockups to one or more designated portions of the permanent work.
7. Provide written meeting minutes for each mock up review indicating items reviewed, approvals, rejections, connections, or other action items.

#### 1.06 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending, damage, and rust.
  1. Label bundles with durable identification tags. Maintain reinforcement identification after bundles are broken.
  2. Store reinforcement to avoid excessive rusting or fouling with grease, oil, dirt or other bond-weakening contaminants.
  3. Avoid damaging applied coatings, if any, on steel reinforcement.

## PART 2 - PRODUCTS

### 2.01 FORMS

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- A. Formwork: / Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth surfaces.
  - 1. Set forms to alignment, grade and required dimensions. Formwork shall not deviate more than 1/4 inch from required vertical positions and 1/4 inch from required horizontal positions. Exposed Surfaces: Provide faced plywood panels complying with, or equivalent to, DOC PS 1, Structural I. Provide minimum 7-ply plywood and provide balance sheets for panels coated one-side only. Furnish in largest practicable sizes to minimize number of joints. Provide Medium-Density Overlay (MDO) panels or high density overlay (HDO) panels, with mill-applied release agent and edge sealant. Provide one of the following panels, or comparable substituted product:
    - a. Olympic Panel Products, "B-Matte 333 MDO Concrete Form." Overlay Color: Brown.
    - b. Pacific Laminate Products, "ProFace MDO." Overlay Color: Black.
    - c. Sylvan Products, LLC, "Armor Ply MDO" Overlay Color: Brown.
  - 2. Hold forms rigidly in place by stakes, clamps, spreaders, and braces at 3 feet on centers, and where required to ensure rigidity.
  - 3. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.
  - 4. Place joint filler or backer rod on vertical surfaces in contact with concrete paving.
  - 5. Benders or thin plank forms may be used on curves, grade changes, or curb returns. Back forms for curb returns may be made of 1/2-inch thick benders cleated together for full depth of the curb.
  - 6. Keep forms in place until concrete is sufficiently hard to prevent damage to concrete.
  - 7. Reuse of Forms:
    - a. Do not reuse forms if there is any evidence of surface wear or defect which would impair quality of surface or edge.
    - b. Thoroughly clean and properly coat forms before reuse.
    - c. Do not use forms from previous projects.
  - 8. Provide new forms specifically purchased for this project. Reuse of forms from past projects or contractors stock will not be accepted.
- B. Curved Work: Kerf back of plywood form-facing panels, or use accepted flexible or curved forms for curved work with a radius of 100 feet or less.
- C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.
  - 1. Obtain written acceptance of form release agent from integral colored concrete pigment manufacturer.
  - 2. Form-release agents shall be non-staining and can cause no visual effect to the finish.
  - 3. Formulate form-release agent with rust inhibitor for steel form-facing materials.

## 2.02 STEEL REINFORCEMENT

- A. Recycled Content: Provide steel reinforcement with an average recycled content of steel so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 60 percent.

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- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.
- D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- E. Low-Alloy-Steel Reinforcing Bars (for Welding): ASTM A 706/A 706M, Grade 60, deformed, unless otherwise indicated.
- F. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.
  - 1. Provide two-component "Speed Dowel System" manufactured by Greenstreak.
- G. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- H. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- I. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
  - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
- J. Zinc Repair Material: ASTM A 780.

## 2.03 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
  - 1. Portland Cement: ASTM C 150, Type II/V, Type I/II or Type IV, gray, unless white cement is required to achieve colors indicated. Supplement with the following:
    - a. Fly Ash: none accepted.
- B. Normal-Weight Aggregates: ASTM C 33, complying with building code. Provide aggregates from a single source. All aggregates shall be free of materials with deleterious reactivity to alkali in cement when tested in accordance with ASTM C 289.
  - 1. Comply with CBC section 1903A.3.
  - 2. Service Class, based on CBC Figure 1904A.2., "Weathering Probability Map":
    - a. Negligible: Class 2N.
  - 3. Service Class, based on CBC Figure 1904.2., "Weathering Probability Map":
    - a. Negligible: Class 2N.
  - 4. Maximum Coarse-Aggregate Size: 1 inch nominal.
    - a. Source: Reliance, Vulcan, San Gabriel, or Carrol Canyon
    - b. Hard rock mix; no pea gravel will be accepted.
  - 5. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
    - a. Source: Reliance, Foster, Corona
    - b. Color to be white to light no dark material.
- C. Water: Potable and complying with ASTM C 94/C 94M.
- D. Shrinkage-Reducing Admixture: Commercially formulated, shrinkage inhibitor capable of reducing initial shrinkage by 80% and long-term shrinkage by 50%. Provide product suitable

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for use with either air-entrained or non-air-entrained concrete as appropriate to structural member and project location.

1. Products: Subject to compliance with requirements, provide one of the following(as required):
  - a. Euclid Chemical Company (The), an RPM company; EUCON SRA, SRA+.
  - b. Grace Construction Products, W. R. Grace & Co.; Eclipse Floor, Eclipse Plus.
  - c. Sika Corporation; Control 40.

## 2.04 CURING MATERIALS

- A. Water: Potable.
- B. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete. Provide products with not more than 100g/L volatile organic content.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. BASF Construction Chemicals, LLC; Confirm.
    - b. Conspec by Dayton Superior; Aquafilm.
    - c. Nox-Crete Products Group; MONOFILM.
- C. Clear, Waterborne, Membrane-Forming Curing Compound (Colored Concrete): Provide products that are acceptable to concrete color pigment manufacturer complying with ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of sealers with no glossy finish and compatible with specified sealer. Provide products with not more than 100g/L volatile organic content.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Sinak Corporation; The Cure WCE or Lithium Cure 1000.
    - b. L. M. Scofield; Cureseal-W.
    - c. Butterfield Color; Clear Guard H2O.
- D. All curing materials should be dissipating without leaving a shiny, cloudy, or glossy finish. Curing material does not substitute requirement of a sealer.

## 2.05 HARDENERS AND SEALERS

- A. Penetrating Liquid Floor and Horizontal Surface Treatment (Sealer): Clear, chemically reactive, waterborne solution of inorganic silicate or silicate water-based lithium quartz materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces. Materials shall be compatible with concrete admixtures and shall be recommended by manufacturer for intended use. Provide product with 0g/L volatile organic content.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Sinak Corporation; Concrete Sealer HLQ 125.
    - b. L. M. Scofield; Cureseal-W.
    - c. Butterfield Color; Clear Guard H2O.
    - d. BASF Construction Chemicals - Building Systems; Kure-N-Harden.
    - e. Dayton Superior Corporation; Edoco by Dayton Superior; Titan Hard.
    - f. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
    - g. L&M Construction Chemicals, Inc.; Seal Hard.



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## 2.06 AGGREGATE BASE

- A. Granular Fill: Class II crushed aggregate per Section 26 of Cal-Trans standards. Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

## 2.07 RELATED MATERIALS

- A. Joint Fillers:
  - 1. Deck-O-Foam polyethylene closed cell expansion joint filler by W.R. Meadows.
  - 2. 1/4" thickness.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Bonding Agent: ASTM C 1059, Type II, non-re-emulsifiable. Provide proprietary products composed of latex polymers.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. W. R. Meadows, Inc.; "Acry-Lok".
    - b. Grace Construction Products, W. R. Grace & Co.; "Daraweld C".
    - c. Larsen Products Corp., "Weld-Crete".
- D. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:
  - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete, and for anchoring dowels to hardened concrete.

## 2.08 DETECTABLE WARNING MATERIALS

- A. General: All detectable warning systems shall comply with Americans with Disabilities Act (28 CFR Part 36 ADA Standards for Accessible Design, Appendix A, Section 4.29.2 Detectable Warnings on Walking Surfaces), and CBC requirements (Section 11B-24, 11B-705 and others). All detectable warning materials shall have raised truncated domes with a base diameter of nominal 0.90 inch (22.9 mm), tapering to a top diameter of 0.45 inch (11.4 mm), a height of nominal 0.20 inch (5.08 mm), and a center-to-center spacing of 2.35 inches (59.7 mm) nominal. The orientation of the dome pattern for all panels shall be parallel with the panel edges. Detectable warning materials shall visually contrast with surrounding areas.
  - 1. California Compliance Warranty: All detectable warning systems shall be approved by DSA-AC. If not approved, DSA will accept a written five (5) year product warranty provided by the manufacturer of detectable warning products and directional surfaces. Such warranty shall indicate compliance with architectural standards as published in the current edition of the California Building Standards Code, and also include durability criteria which indicate that the shape, color fastness, confirmation, sound-on-cane acoustic quality, resilience, and attachment will not degrade significantly for at least five (5) years after initial installation. As defined by the State, "not degrade significantly" means that the product maintains at least 90 percent of its approved design characteristics, as determined by the enforcing agency.
- B. Concrete Paver Detectable Dome Warning System: Provide standard size precast architectural concrete paving units for installation in sand or mortar beds.

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1. Basis-of Design Product: Provide the following, or comparable substitute product:
  - a. Acker-Stone Industries, Inc., ADA Pavers-Truncated Domes.
    - 1) Size: per approved plans and details. Nominal 12 inches by 12 inches by 2 3/8 inches (4.7 cm by 4.7 cm by 6 cm).
    - 2) Color: per approved plans and details. As selected by Architect from manufacturer's complete range.
  - b. Tectura designs - ADA-2 Truncated dome pavers.
    - 1) 12 inches by 12 inches nominal(actual 11.8 inches X 11.8 inches) by 2 3/8 inches
    - 2) Color as selected by Architect from manufacturer's complete range.

## 2.09 PAVEMENT MARKINGS

- A. Color: As indicated.
- B. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint; paint to be at least as slip resistant as the adjacent surface.
  1. Color: White, green, unless otherwise indicated. Use for non-accessible striping, directional arrows, numbering, and lettering.
  2. Accessibility Color: Paint accessibility lines and markings blue color equal to Color No. 15090 per Federal Specification 595C.

## 2.10 WHEEL STOPS

- A. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 6 inches high by 7 inches wide by 72 inches long at singles stalls and XX inches long at shared stalls. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.
  1. Dowels: Galvanized steel, 5/8 inch in diameter, 18-inch minimum length.

## 2.11 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
  1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
  2. Proportioning:
    - a. The proportioning of ingredients shall be such that the concrete can be readily worked into forms and around reinforcement under the conditions of placement to be used, without segregation or excessive bleeding.
    - b. When proportioning by weight of loose, dry material, 94 pounds of cement shall be considered 1 cubic foot.
      - 1) Float/Broom Finish: Coarse aggregate 50 percent-50 percent fine aggregate.
      - 2) Retarder finish: Coarse aggregate 40 percent, fine aggregate 60 percent.
      - 3) Exposed Aggregate Finish: Coarse aggregate 65 percent, fine aggregate 35 percent.
      - 4) Abrasive blast finish: Coarse aggregate 40 percent, fine aggregate 60 percent.
    - c. Total water content shall not exceed 35 gallons per cubic yard of concrete.

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- d. Weighing equipment shall be accurate within 1 pound and shall be adjustable for varying aggregate moisture content.
  - e. A beam auxiliary shall register any part of the last 100 pounds of each aggregate. The aggregate hopper shall have a volume adjustment.
3. Prepare compressive strength data for both 7-day and 28-day strengths.
  - a. The 7-day compressive strength shall be at least 60 percent of the required 28-day strength.
  - b. The 28-day compressive strength shall be as indicated.
  - c. Provide drying shrinkage test data at 28 days, from not less than 3 test specimens.
- B. When automatic machine placement is used, prepare and submit design mixtures suitable for use with machine placement, including reduced slump as required. Obtain laboratory test results that meet or exceed requirements.
- C. Proportion mixtures to provide normal-weight concrete with the following properties:
  1. Typical Compressive Strength (28 Days): Provide the following minimum compressive strength (28 days) for concrete paving unless otherwise indicated: 3000 psi.
  2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50
  3. Slump Limit: 4 inches, plus or minus 1 inch, unless indicated otherwise.
    - a. Slump Limit (High-Range Water-reducing Admixture): 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture, plus or minus 1 inch, unless indicated otherwise.
    - b. Slump Limit (Plasticizing Admixture): 8 inches for concrete with verified slump of 2 to 4 inches before adding plasticizing admixture, plus or minus 1 inch, if required.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement. Limit total chloride-ion content in hardened concrete to 0.10 percent by weight of concrete when tested per AASHTO T 260 potentiometric titration.
- E. Limit "drying shrinkage" after 28 days of curing hardened concrete to 0.045 percent of the original concrete volume.
- F. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- G. Chemical Admixtures: Admixtures may only be used if they are incorporated into the accepted concrete mix designs. Use admixtures according to manufacturer's written instructions.
  1. Use water-reducing admixture in concrete as required for placement and workability.
  2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
  4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

## 2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M[ and ASTM C 1116/C 1116M]. Furnish batch certificates for each batch discharged and used in the Work.

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1. When air temperature is between 85 and 90 deg. F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg. F (32 deg. C), reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
- C. For concrete batches of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
- D. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
- E. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
  1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
  2. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Division 31 Section "Earth Moving."
- C. Proceed with concrete paving installation only after unsatisfactory conditions have been corrected.

#### **3.02 PREPARATION**

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

#### **3.03 EDGE FORMS AND SCREED CONSTRUCTION**

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.
- C. Slope stair and step treads at not less than 1.0 percent and not more than 2.0 percent cross slope to drain.

#### **3.04 STEEL REINFORCEMENT**

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as

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required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

### 3.05 JOINTS

- A. General: Form construction, isolation or expansion joint, and saw cut / contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
  - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Isolation (Expansion) Expansion Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
  - 1. Locate expansion joints at intervals of 20 feet maximum unless otherwise indicated.
  - 2. Extend joint fillers full width and depth of joint and recess 1 inch from finish surface where no joint sealant is indicated.
  - 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
  - 4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  - 5. Break steel at expansion joints.
  - 6. Dowels- provide prefabricated 'speed dowel' assemblies.
- C. Saw Cut (Control) Joints: Form weakened-plane saw cut joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth plus 1/4 inch of the concrete thickness, as follows, and to match jointing of existing adjacent concrete paving:
  - 1. Continue steel reinforcement across sawcut joints unless otherwise indicated.
- D. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/8-inch radius unless otherwise noted. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

### 3.06 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in. Notify other trades as necessary to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

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1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, and side forms. Use only square-faced shovels for hand spreading and consolidation.  
Consolidate with care to prevent dislocating reinforcement, dowels and joint devices.
- H. Screed paving surface with a straightedge and strike off.
- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- J. Curbs and Gutters: Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.
- K. Slip-Form Paving: Use accepted design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
- L. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.
- M. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
  1. When air temperature has fallen to or is expected to fall below 40 deg. F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg. F (10 deg C) and not more than 80 deg. F (27 deg C) at point of placement.
  2. Do not use frozen materials or materials containing ice or snow.
  3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- N. Hot-Weather Placement: Comply with ACI 305R (ACI 305R M) and as follows when hot-weather conditions exist:
  1. Cool ingredients before mixing to maintain concrete temperature below 90 deg. F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
- O. Provide sand and base materials as indicated.

### 3.07 FLOAT/BROOM FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture. Required to meet slip coefficient requirement.

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2. Portland cement concrete paving shall be stable, firm, and slip resistant and shall comply with CBC Sections 11B-302 and 11B-403.

### 3.08 ABRASIVE BLAST FINISHING

- A. General: Perform abrasive blasting after compressive strength of concrete exceeds 2000 psi, and is at least 28 days old Coordinate with formwork removal to ensure that surfaces to be abrasive blasted are treated at same age for uniform results.
  1. Surface Continuity: Perform abrasive-blast finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work. Maintain required patterns or variances in depths of blast to match design reference sample or mockup.
  2. Abrasive Blasting: Abrasive blast corners and edges of patterns carefully, using backup boards, to maintain uniform corner or edge line. Determine type of nozzle, nozzle pressure, and blasting techniques required to match design reference sample or mockup.
  3. Depth of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surfaces to match design reference sample or mockup, as follows and as required by Architect:
    - a. Retain degree of abrasive-blast cut in "Brush," "Light," "Medium," or "Heavy" subparagraphs below to suit Project.
    - b. Brush: Remove cement matrix to dull surface sheen and expose face of fine aggregate; with no significant reveal.
    - c. Light to Medium: Expose fine aggregate with occasional exposure of coarse aggregate and uniform color; with maximum reveal of 1/16 inch.
    - d. Medium: Generally expose coarse aggregate; with slight reveal, a maximum of 1/8 inch.
    - e. Heavy: Expose and reveal coarse aggregate to a maximum projection of one-third its diameter; with reveal range of 1/4 to 5/16 inch.
    - f. Portland cement concrete paving shall have a medium sandblast finish equal to medium broom finish on all surfaces sloped less than 6% and slip resistant (heavy sandblast finish equal to heavy broom finish) on all surfaces sloped greater than 6%.
    - g. Portland cement concrete paving shall be stable, firm and slip resistant and shall comply with **CBC Sections 11B-302 and 11B-403**.
  4. Abrasive Blasting: Abrasive blast corners and edges of patterns carefully, using backup boards, to maintain uniform corner or edge line. Determine type of nozzle, nozzle pressure, and blasting techniques required to match design reference sample or mockup.
  5. Insert specific abrasive materials or processes if required for Project.

### 3.09 DETECTABLE WARNINGS

- A. Detectable Warnings, General: Install detectable warnings as part of the concrete paving placement sequence. Set true to line and elevation. Comply with maximum slope and cross-slope requirements for accessible walkways.
  1. Blockouts: Form blockouts in concrete and asphalt pavements for installation of detectable paving units.
    - a. Tolerance for Opening Size: Plus 1/4 inch, no minus.
- B. Detectable warnings surfaces shall comply with **CBC Section 11B-705.1**.

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- C. Detectable warning surfaces shall be yellow conforming to FS 33538 of Federal Standard 595C, except for locations at curb ramps, islands, or cut through medians where color used shall contrast visually with that of adjacent walking surfaces, either light-on-dark or dark-on-light. **CBC Sections 11B-705.1.1.3 and 11B-705.1.1.5.**
- D. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound-on-cane contact. **CBC Section 11B-705.1.1.4.**
- E. Provide 5 year minimum warranty per **DSA Bulletin 10/31/02, revised 04/09/08.**
- F. Precast Detectable Warning Tiles: Comply with approved plans and details along with manufacturer's written instructions.
- G. Surface-Mounted Detectable Warning Tiles: Comply with manufacturer's written instructions. Do not install directly over asphalt pavements.
- H. For installation at asphalt pavements, comply with installation indicated on Drawings. If not indicated, provide one of the following installation methods:
- I. Saw-cut and remove asphalt pavement in location of warning tile to a minimum depth of 6 inches. Replace removed pavement materials with reinforced concrete paving materials. When cured, install surface-mounted detectable warning tiles.
- J. Provide 0.032 inch aluminum separation sheet cut to same size as surface mounted tiles. Adhere sheet to asphalt paving with a thin coat of urethane adhesive, holding adhesive 1 inch from edge of sheet. Install surface-mounted detectable warning tiles to sheet with adhesive and mechanical fasteners per manufacturer's written instructions.
- K. Cast-in-Place Detectable Warning Pavers: Integrate into installation of unit pavers. Comply with manufacturer's written instructions.
- L. Cast-in-Place Detectable Warning Grooves: Install detectable warnings as part of the concrete paving placement sequence. Set true to line and elevation. Form well-defined, clean grooves with appropriate tools.

### 3.10 CONCRETE PROTECTION, CURING AND SEALING:

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these as follows:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or



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tears occurring during installation or curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.
- F. Seal Concrete: Apply specified sealer in accordance with manufacturer's recommendations.
1. Apply full strength in two coats with airless sprayer at the manufacturer's recommended rate.
  2. After the first coat is completely dry, apply second coat at right angles to the first coat.

### 3.11 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117, the Americans with Disabilities Act, the CBC and as follows:
1. Elevation: 1/8 inch.
  2. Thickness: Plus 3/8 inch, minus 1/4 inch.
  3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/8 inch. Surface must properly drain.
  4. Surface Discontinuities: Maximum 1/4 inch, subject to further limitations of accessible routes.
  5. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
  6. Lateral Alignment and Spacing of Dowels: 1/4 inch.
  7. Vertical Alignment of Dowels: 1/8 inch.
  8. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/8 inch per 12 inches of dowel.
  9. Joint Spacing: 3 inches, except joint position shall be within 1/4 inch of objects in alignment with joint such as benches, light poles, pull boxes, etc.
  10. Sawcut Joint Depth: Plus 1/4 inch, no minus.
  11. Joint Width: Plus 1/16 inch, no minus.
- B. Stair Treads: Stair treads within a run shall be constructed equally and shall shed water away from the path of travel. Maximum tread slope down from riser to nosing in direction of travel: 1.0 percent, plus or minus 0.5 percent. Maximum tread cross-slope perpendicular to direction of travel: 2.0 percent, plus 0.0 percent, minus 1.0 percent or as required to shed water.
- C. Ramps: Ramps shall shed water away from the path of travel. Maximum ramp slope in direction of travel: 8.33 percent. Maximum ramp cross-slope perpendicular to direction of travel: 2.0 percent, plus 0.0 percent, minus 1.0 percent or as required to shed water.

### 3.12 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow concrete paving to cure for a minimum of 28 days and be dry before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.

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- D. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils. Provide markings with a minimum width of 3 inches.
  - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
  - 2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb./gal.
- E. Accessible parking spaces serving a particular building or facility shall be located, and dispersed if serving more than one accessible entrance, on the shortest accessible routes to an entrance or to multiple accessible entrances. **CBC Section 11B-208.3.1.**
- F. Accessible parking spaces in a parking facility not serving a particular building or facility shall be located on the shortest accessible route to an accessible pedestrian entrance of the parking facility. **CBC Section 11B-208.3.1.**
- G. Minimum number of required accessible parking spaces shall be provided in accordance with **CBC Table 11B-208.2** for each parking facility provided.
- H. For every six or fraction of six accessible parking spaces, at least one shall be an accessible van parking space. **CBC Section 11B-208.3.1.**
- I. Accessible parking spaces and access aisles shall comply with **CBC Section 11B-502** and shall be dimensioned to the centerlines of the marked lines as follows:
  - 1. Parking spaces and access aisles shall be marked according to **CBC figures 11B-502.2, 11B-502.3, and 11B-502.3.3**. Their surfaces shall comply with **CBC Section 11B-302** and shall be at the same level with the slopes not steeper than 1:48 in any direction. **CBC Section 11B-502.4.**
  - 2. Parking spaces shall be 9'x18' minimum and van parking spaces shall be 12'x18' minimum with an adjacent access aisle of 5'x18' minimum. Access aisles shall be placed on either side of the parking spaces except be located on the passenger side for van parking spaces. Van parking spaces shall be permitted to be 9'x18' minimum where the access aisle is 8'x18' minimum.
  - 3. Access aisles shall be marked by a blue painted borderline around their perimeter. The areas within the blue borderlines shall be marked with hatched lines a maximum of 36" on center in a color contrasting with that of the aisle surface, preferably blue or white. Access aisle markings may extend beyond the minimum required length. **CBC Section 11B-502.3.3**
  - 4. Access aisles (parking spaces as well- similar application) shall not overlap the vehicular way. **CBC Section 11B-502.3.4**
  - 5. A vertical clearance of 8'-2" minimum shall be provided for accessible parking spaces, access aisles, and vehicular routes serving them. **CBC Section 11B-502.5**
- J. At least one passenger loading zone shall be provided in every continuous 100 linear feet of loading zone space, or fraction thereof, complying with **CBC Section 11B-209 and 11B-503** as follows:
  - 1. Vehicle pull-up spaces shall be 8' x 20' minimum. Access aisles shall be 5' x 20' minimum and shall be adjacent and parallel to the vehicular pull-up spaces. They shall be the same level with slopes not steeper than 1:48 in any direction. **CBC Section 11B-503.4.**
  - 2. Access aisles for passenger drop-off and loading zones shall be marked with a painted borderlines around their perimeter. The areas within the borderlines shall be marked with hatched lines a maximum of 36" on center in a color contrasting with

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that of the aisle surface. **CBC Section 11B-503.3.**

3. A vertical clearance of 9'-6" minimum shall be provided for vehicle pull-up spaces, access aisles, and a vehicular route serving them connecting a vehicular entrance and a vehicular exit. **CBC Section 11B503.5.**

### 3.13 WHEEL STOPS

- A. Securely attach wheel stops to paving with not less than two #5 galvanized steel dowels, minimum 24 inches long, located at one-quarter to one-third points. Install dowels in drilled holes in the paving and bond dowels to wheel stop. Recess head of dowel beneath top of wheel stop.
- B. Install preformed speed [bumps] [humps] [cushions] in bed of adhesive applied as recommended by manufacturer for heavy traffic.
- C. Securely attach preformed speed [bumps] [humps] [cushions] to paving with hardware spaced as recommended by manufacturer for heavy traffic. Recess head of hardware beneath top surface.

### 3.14 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  1. Testing Frequency: Obtain at least one composite sample for each 20 cu. Yd., or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg. F and below and when it is 80 deg. F and above, and one test for each composite sample.
  5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
  6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
    - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Owner, Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive

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strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Remove and replace concrete paving where test results indicate that it does not comply with specified requirements. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

### 3.15 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, cracked, chipped, stained or defective or that does not comply with requirements in this Section as determined by Landscape Architect. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with Portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude all but pedestrian traffic from paving for at least 28 days after placement. When construction traffic is permitted, maintain paving as clean as possible by providing adequate surface protection and by removing surface stains and spillage of materials as they occur.
  - 1. Rubber tire marks are unacceptable in the completed construction.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Project Completion inspections.
- E. Repair of damaged, defective or rejected concrete is not permitted. Remove all concrete from expansion joint to expansion joint or greater as required to provide a constant continuous finish.

### 3.16 FINAL CLEANING

- A. Remove all excess concrete, form materials, over pours, waste, etc., and legally dispose off-site.
- B. Provide a final acid and power wash for all concrete paving surfaces. Do not use any material that will affect the appearance of the concrete.
- C. All over pours in planting areas should be removed prior to landscape operations.
- D. Clean concrete paving to remove stains, markings, dust, and debris.

**END OF SECTION**

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## SECTION 321373 PAVEMENT JOINT SEALERS

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES: RELATED DOCUMENTS

- A. Exterior joint sealant for non-traffic surfaces.

#### 1.02 RELATED REQUIREMENTS

- A. Division 32 Section Concrete Paving.
- B. Division 32 Section Architectural Site Concrete

#### 1.03 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch- (13-mm-), and 1/4-inch (6.4-mm) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

#### 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

#### 1.06 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
- B. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (4.4 deg C).
- C. When joint substrates are wet or covered with frost.
- D. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
- E. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

#### 2.02 MATERIALS, GENERAL

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- 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 sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Landscape Architect from manufacturer's full range.

#### 2.03 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

#### 2.04 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

### PART 3 EXECUTION

#### 3.01 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 joint-sealant performance.

#### 3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on 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.

#### 3.03 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 backer materials of type 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 backer materials.
  - 2. Do not stretch, twist, puncture, or tear backer materials.
  - 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

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- D. 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 provided for each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.
- F. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

#### 3.04 **CLEANING**

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

#### 3.05 **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 and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

#### 3.06 **SCHEDULE**

- A. Horizontal Joints, less than 5 percent slope; Sealant No. 1.
- B. Horizontal Joints, grades steeper than 5 percent; Sealant No. 2
- C. Vertical Joints; Sealant No. 2

**END OF SECTION**

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## **SECTION 321723.13 PAINTED PAVEMENT MARKINGS**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Parking lot markings, including parking bays, crosswalks, arrows, handicapped symbols and curb markings.
- B. Roadway lane markings and crosswalk markings.
- C. "No Parking" curb painting.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 321216 - Asphalt Paving.

#### **1.03 REFERENCE STANDARDS**

- A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.
- B. California MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; State of California Department of Transportation (FHWA's MUTCD as amended for use in California); current edition.

#### **1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver paint in containers of at least 5 gallons (18 L) accompanied by batch certificate.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

#### **1.06 FIELD CONDITIONS**

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. Line and Zone Marking Paint: MPI (APL) No. 97 Latex Traffic Marking Paint; color(s) as indicated.
  - 1. Parking Lots: White.
  - 2. Handicapped Symbols: Blue.
  - 3. Fire Lane ("No Parking"): Red with white lettering.
- B. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

### **PART 3 EXECUTION**



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### 3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.02 PREPARATION

- A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Clean surfaces thoroughly prior to installation.
  - 1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
  - 2. Completely remove rubber deposits, existing paint markings, and other coatings adhering to the pavement, by scraping, wire brushing, sandblasting, mechanical abrasion, or approved chemicals.
- D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.
- E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.
- F. Temporary Pavement Markings: When required or directed by Architect, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.
  - 1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
  - 2. At Contractor's option, temporary marking tape may used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner.

### 3.03 REQUIREMENTS

- A. Accessible parking spaces serving a particular building or facility shall be located, and dispersed if serving more than one accessible entrance, on the shortest accessible routes to an entrance or to multiple accessible entrances. **CBC Section 11B-208.3.1.**
- B. Accessible parking spaces in a parking facility not serving a particular building or facility shall be located on the shortest accessible route to an accessible pedestrian entrance of the parking facility. **CBC Section 11B-208.3.1.**
- C. Minimum number of required accessible parking spaces shall be provided in accordance with **CBC Table 11B-208.2** for each parking facility provided.
- D. For every six or fraction of six accessible parking spaces, at least one shall be an accessible van parking space. **CBC Section 11B-208.2.4.**
- E. Accessible parking spaces and access aisles shall comply with **CBC Section 11B-502** and shall be dimensioned to the centerline of the marked lines as follows:
  - 1. Parking spaces and access aisles shall be marked according to **CBC Section 11B-502.2, 11B-502.3, and 11B-502.3.3.** Their surfaces shall comply with **CBC Section 11B-302** and shall be at the same level with slopes not steeper than 1:48 in any direction. **CBC Section 11B-502.4.**

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2. Parking spaces shall be 9' x 18' minimum and van parking spaces shall be 12' x 18' minimum with an adjacent access aisle of 5' x 18' minimum. Access aisles shall be placed on either side of the parking spaces except be located on the passenger side for van parking spaces. Van parking spaces shall be permitted to be 9' x 18' minimum where the access aisle is 8' x 18' minimum.
  3. Access aisles shall be marked by a blue painted borderline around their perimeter. The area within the blue borderlines shall be marked with hatched lines a maximum of 36" on center in a color contrasting with that of the aisle surface, preferably blue or white. Access aisle markings may extend beyond the minimum required length. **CBC Section 11B-502.3.3.**
  4. Access aisles (parking spaces as well - similar application) shall not overlap the vehicular way. **CBC Section 11B-502.3.4.**
  5. A vertical clearance of 8'-2" minimum shall be provided for accessible parking spaces, access aisles, and vehicular routes serving them. **CBC Section 11B-502.5**
- F. At least one passenger loading zone shall be provided in every continuous 100 linear feet of loading zone space, or fraction thereof, complying with **CBC Section 11B-209 and 11B-503** as follows:
1. Vehicle pull-up spaces shall be 8' x 20' minimum. Access aisles shall be 5' x 20' minimum and shall be adjacent and parallel to the vehicular pull-up spaces. They shall be the same level with slopes not steeper than 1:48 in any direction. **CBC Section 11B-503.4.**
  2. Access aisles for passenger drop-off and loading zones shall be marked with a painted borderlines around their perimeter. The areas within the borderlines shall be marked with hatched lines a maximum of 36" on center in a color contrasting with that of the aisle surface. **CBC Section 11B-503.3.**
  3. A vertical clearance of 9'-6" minimum shall be provided for vehicle pull-up spaces, access aisles, and a vehicular route serving them connecting a vehicular entrance and a vehicular exit. **CBC Section 11B-503.5.**
- G. Bus loading zones and bus stops shall comply with **CBC Sections 11B-209 and 11B-810.2** as follows:
1. Boarding and alighting areas shall be 8' x 5' minimum, with 8' measured perpendicular to the curb or vehicle roadway edge, and with 5' measured parallel to the vehicle roadway. Slopes in 8' direction shall be 1:48 maximum. Slopes in 5' direction shall be the same as that of the roadway, to the maximum extent practicable. **CBC Figure 11B-810.2.2.**
  2. Bus shelters shall provide a minimum 30" x 48" clear floor or ground space (36" x 48" or 36" x 60" as applicable in an alcove), with slopes not steeper than 1:48 in any direction, entirely within the shelter complying with **CBC Section 11B-305.**
  3. Bus shelters shall be connected by an accessible route complying with **CBC Section 11B-402** to a boarding and alighting area complying with **CBC Section 11B-810.2.** **CBC Figure 11B-810.3.**

### 3.04 INSTALLATION

- A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.
- B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F (10 degrees C) or more than 95 degrees F (35 degrees C).
- C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

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- D. Comply with California MUTCD manual for details not shown.
- E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.
- F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on drawings true, sharp edges and ends.
  - 1. Length Tolerance: Plus or minus 3 inches (75 mm).
  - 2. Width Tolerance: Plus or minus 1/8 inch (3 mm).
- G. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
  - 1. Mark the International Handicapped Symbol at indicated parking spaces.
  - 2. Hand application by pneumatic spray is acceptable.
- H. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

### 3.05 DRYING, PROTECTION, AND REPLACEMENT

- A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.
- B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.
- C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.
- D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.
- E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.
- F. Replace removed markings at no additional cost to Owner.

### END OF SECTION

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## SECTION 323113 CHAIN LINK FENCES AND GATES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Fence framework, fabric, and accessories.
- B. Excavation for post bases; concrete foundation for posts.
- C. Manual gates and related hardware.

#### 1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete anchorage for posts.
- B. Section 337900 - Site Grounding.

#### 1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric 2011a (Reapproved 2017).
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2019a.
- E. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2018.
- F. ASTM F567 - Standard Practice for Installation of Chain-Link Fence 2014a.
- G. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric 2017.
- H. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework 2018.
- I. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures 2018.
- J. ASTM F1665 - Standard Specification for Poly(Vinyl Chloride)(PVC) and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used with Chain-Link Fence 2008 (Reapproved 2013).
- K. CLFMI CLF 2445 - Product Manual - Drawings 2012.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.
- C. Shop Drawings: Indicate in plan layout and elevation, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.
- D. Manufacturer's Installation Instructions: Indicate installation requirements , post foundation anchor bolt templates,.
- E. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

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## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Posts, Rails, and Frames: ASTM F1083 Schedule 40 hot-dipped galvanized steel pipe, welded construction, minimum yield strength of 30 ksi (205 MPa).
- B. Wire Fabric: ASTM A 392 zinc coated steel chain link fabric.

### 2.02 COMPONENTS

- A. As noted and shown on the drawings; the following are provided as minimum dimensions Unless Noted Otherwise.
- B. Line Posts: 2.38 inch (60 mm) diameter.
- C. Corner and Terminal Posts: 4.0 inch (100 mm).
- D. Vehicular Gate Posts: 4.5 inch (114 mm) diameter.
- E. Pedestrian Gate Posts: 4.0 inch (100 mm) diameter.
- F. Top and Brace Rail: 1.66 inch (42 mm) diameter, plain end, sleeve coupled.
- G. Pedestrian Gate Frame: 1.66 inch (42 mm) diameter for welded fabrication.
- H. Vehicular Gate Frame: 1.90 inch (48 mm) diameter for welded fabrication.
- I. Fabric: 2 inch (51 mm) diamond mesh interwoven wire, 6 gage, 0.1620 inch (4.12 mm) thick, top selvage knuckle end closed, bottom selvage twisted tight.
- J. Tension Wire: 6 gage, 0.1620 inch (4.12 mm) thick steel, single strand.
- K. Tension Band: 3/8 inch (9 mm) thick steel.
- L. Tie Wire: Aluminum alloy steel wire.

### 2.03 ACCESSORIES/HARDWARE

- A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.
- B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.
- C. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches (1525 mm) high, 3 for taller gates; fork latch with gravity drop and padlock hasp ; keeper to hold gate in fully open position.
- D. Hardware for Double Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches (1525 mm) high, 3 for taller gates; drop bolt on inactive leaf engaging socket stop set in concrete, active leaf latched to inactive leaf preventing raising of drop bolt, padlock hasp ; keepers to hold gate in fully open position.
- E. Privacy Slats: Vinyl strips, sized to fit fabric weave.
- F. Gates that are part of the accessible route shall meet all the requirements of an accessible door in compliance with **CBC Section 11B-404**.
- G. The lever of lever actuated latches or locks for an accessible gate shall be curved with a return to within 1/2" of the (face of) gate to prevent catching on the clothing or persons.  
**California Referenced Standards code. T-24 part 12, Section 12-10-202, Item (F).**
- H. Swing doors and gate surfaces within 10" of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16" of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped.  
**CBC Section 11B-404.2.10**
- I. The clear opening width for a door shall be 32" minimum. For a swinging doors it shall be measured between the face of the door and the stop, with the door open 90 degrees. There

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shall be no projections into it below 34" and 4" maximum projections into it between 34" and 80" above the finish floor or ground. Door closers and stops shall be permitted to be 78" minimum above the finish floor or ground. **CBC Section 11B-404.2.3**

- J. Handles pulls, latches, locks, and other operable parts on accessible doors shall comply with **CBC Section 11B-309.4** and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34" minimum and 44" maximum above finish floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides. **CBC Section 11B-404.2.7**
- K. The force for pushing or pulling open a door shall be as follows: **CBC Section 11B-404.2.9**
  - 1. Interior hinged doors, sliding or folding doors: **5 pounds(22.2N)** maximum. Required fire doors: the minimum opening force allowable by the DSA authority, not to exceed **15 pounds (67N)**. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.
  - 2. The force required for activating any operable parts, such as lever hardware, or disengaging other devices shall be 5 pounds(22.2 N)maximum to comply with CBC Section 11B-309.4
- L. Door closing speed shall be as follows: **CBC Section 11B-404.2.8**
  - 1. Closer shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is **5 seconds** min.
  - 2. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is **1.5 seconds** minimum.
- M. Thresholds shall comply with **CBC Section 11B-404.2.5**
- N. Floor stops shall not be located in the path of travel and 4" maximum from walls. **DSA Policy 99-08.**
- O. Hardware (including panic hardware) shall not be provided with "Night Latch" (NL) function for any accessible doors or gates unless the following conditions are met per **DSA Interpretation 10-08 DSA/AC (External), revised 4/28/09**. Such conditions must be clearly demonstrated and indicated in the specifications:
  - 1. Such hardware has a 'dogging' feature.
  - 2. It is dogged during the time the facility is open.
  - 3. Such 'dogging' operation is performed only by employees as their job function(non-public use).
- P. Pair of doors: limit swing of one leaf to 90 degrees so that a clear floor space is provided beyond the arc of the swing for the wall-mounted tactile sign. **CBC Section 11B-703.4.2.1**

## 2.04 FINISHES

- A. Components (Other than Fabric): Galvanized in accordance with ASTM A123/A123M, at 1.7 oz/sq ft (530 g/sq m).
- B. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.
- C. Accessories: Same finish as framing.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install framework, fabric, accessories and gates in accordance with ASTM F567.
- B. Place fabric on outside of posts and rails.

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- C. Set intermediate posts plumb , in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.
- D. Line Post Footing Depth Below Finish Grade: ASTM F 567.
- E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F 567.
- F. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.
- G. Provide top rail through line post tops and splice with 6 inch (150 mm) long rail sleeves.
- H. Install center brace rail on corner gate leaves.
- I. Do not stretch fabric until concrete foundation has cured 28 days.
- J. Stretch fabric between terminal posts or at intervals of 100 feet (30 m) maximum, whichever is less.
- K. Position bottom of fabric 2 inches (50 mm) above finished grade.
- L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches (380 mm) on centers.
- M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- N. Install bottom tension wire stretched taut between terminal posts.
- O. Install support arms sloped inward and attach barbed wire; tension and secure.
- P. Do not attach the hinged side of gate to building wall; provide gate posts.
- Q. Install hardware and gate with fabric and barbed wire overhang to match fence.
- R. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.
- S. Ground fence in accordance with Section 337900.

### 3.02 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm).
- B. Maximum Offset From True Position: 1 inch (25 mm).
- C. Components shall not infringe adjacent property lines.

### END OF SECTION

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## SECTION 323119 TUBE STEEL FENCES AND GATES

### PART1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Tube steel fencing.
- B. Tube steel gates.
- C. Accessible gate hardware
- D. Horizontal sliding gates.

#### 1.02 RELATED REQUIREMENTS

- A. Division 03 Section Cast-in-Place Concrete Division 03 Section Cast-in-Place Concrete
- B. Division 07 Section Joint Sealants
- C. Division 08 Section Door Hardware
- D. Division 09 Section High Performance Exterior Metal Coatings
- E. Division 32 Section Architectural Site Concrete

#### 1.03 SUBMITTALS

- A. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
  - 1. Prepare Project specific information, drawn accurately to scale. Shop Drawings shall not be reproductions of the Contract Documents or any standard printed data.
  - 2. Where installed metal fabrications are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified professional engineer who was responsible for the preparation.
- B. Product data in the form of manufacturer's technical data, specifications, and installation instructions for fence and gate posts, fabric, gates, hardware and accessories specified in the section.
  - 1. Fence and gate posts, rails, and fittings.
  - 2. Gates and hardware, including accessible gate lever lockset.
  - 3. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

#### 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has at least three years' experience and has completed at least five tube steel fence projects with same material and of similar scope to that indicated for this Project with a successful construction record of in-service performance.
- B. Single-Source Responsibility: Obtain tube steel fences and gates, including accessories, fittings, and fastenings, from a single source.

#### 1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for fences and gates shown on the Drawings in relation to the property survey and existing structures. Verify dimensions by field measurements.



## PART 2 PRODUCTS

### 2.01 TUBE STEEL FENCE

- A. All parts shall be square tube steel. All posts, frames, rails, and braces parts shall be galvanized tube steel meeting the requirements of ASTM A 500 grade B.787. All other tube steel shall meet the requirements of ASTM A 513. All posts shall have a welded post cap. The following minimum sizes shall be used:

1. Minimum

a. Item	O.D.	Wall Thickness
b. Line Posts	2" or 3"	0.188"
c. Corner Posts, Terminal Posts	4"	0.188"
d. Pedestrian Gate Posts	4"	0.188"
e. Vehicular Gate Posts	6"	0.188"
f. Pedestrian Gate Rails, Frame and Braces	2"	0.188"
g. Pedestrian Fence Top Rail	2"	0.188"
h. Pedestrian Fence Bottom Rail	2"X4"	0.188"
i. Fence and Gate Pickets	3/4"	0.125"

- B. Infill Panels: Custom design as indicated on Drawings.

1. Perforated Metal Sheet: Uncoated steel sheet, perforated as indicated, 0.052-inch (1.52-mm) nominal thickness.

- C. Steel Finish: High-performance coating.

### 2.02 PEDESTRIAN GATES

- A. Pedestrian gates shall have a ladder type frame, i.e., two vertical ends and two horizontal rails and made of steel tubing, gate pickets, provisions for locking hardware, kickplate/kickbox, drop rod and gate hardware.
- B. Frame Corner Construction: Welded with an intermediate rail for panels 5 feet (1.52 m) wide or wider.
- C. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet (1.52 m) wide. Provide center gate stops and cane bolts for pairs of gates.
- D. Steel Finish: High-performance coating.

### 2.03 HARDWARE

- A. Pedestrian Gate Hardware: Provide galvanized hardware and accessories for each gate according to the following:
- B. Accessible Latch/Lockset: Locksets shall be heavy-duty with hinged, anti-friction, 1-inch throw latchbolt with anti-friction piece made of self-lubricating stainless steel. Provide locksets with interchangeable core cylinders. Provide double cylinder, keyed to match building exterior doors. Locksets to be furnished with thru-bolted hardware to attached through gate frame, round or square post stock. Lever handles must be of forged or cast brass, bronze or stainless steel construction.
1. Basis-of-Design Products:
- a. Locksets to be furnished with thru-bolted hardware to attached through gate frame, round or square post stock. Lever handles must be of forged or cast brass, bronze or stainless steel construction

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- b. Panic Hardware: Von Durpin CD99NL x 99DY SNB
  - c. Closer: LCN Closer 7500H
- C. Kickplate: Smooth solid metal surface (12GA), to match frame material and finish, along the entire width of the gate, and minimum of 10" above the pedestrian surface to be provide at all accessible pedestrian gates. Trimco or approved equal.
- D. All gate drop rod assemblies are to use a 1/2" diameter solid steel center stop. Provide a 12" steel sleeve. In asphalt areas secure sleeve in a 12" diameter by 18" deep concrete footing.
- E. All non-automated vehicular and fire lane gates shall have a hold open post. Posts shall have a provision for locking the gate to the post in the open position.
- F. Pedestrian Gate 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.
  - 3. Weld surface to attach to post or jamb
  - 4. Size & Quantity: 5" x 1-1/4" (3 per leaf).
- G. Exit Hardware: BHMA A156.3, Grade 1, Type 1 (rim exit device), with push pad actuating bar, suitable for exterior use.
  - 1. Basis of Design: Duprin 98L, 630 finish with rim cylinder.
  - 2. Function: 04 - Entrance by trim when latch bolt is released by key or set in a retracted position by key.
  - 3. Mounting Channel: Bent-plate channel formed from 1/8-inch- (3.2-mm-) thick, steel plate. Channel spans gate frame. Exit device is mounted on channel web, recessed between flanges, with flanges extending 1/8 inch (3.2 mm) beyond push pad surface.
- H. Cane Bolts: Provide for inactive leaf of pairs of gates. Fabricated from 1/2-inch- (12.7 -mm-) diameter, round steel bars, hot-dip galvanized after fabrication, unless otherwise shown on drawings. Finish to match gates. Provide galvanized-steel pipe strikes to receive cane bolts in both open and closed positions.
- I. Gate Keeper: Galvanized steel, duckbill type to auto-engage in open position and hold open. High Performance coating to match fence and gate color.
- J. Gates that are part of the accessible route shall meet all the requirements of an accessible door in compliance with **CBC Section 11B-404.**
- K. The lever of lever actuated latches or locks for an accessible gate shall be curved with a return to within 1/2" of the (face of) gate to prevent catching on the clothing or persons. **California Referenced Standards code. T-24 part 12, Section 12-10-202, Item (F).**
- L. Swing doors and gate surfaces within 10" of the finish floor or ground shall have a smooth surface on the push side extending the full width of th door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16" of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped. **CBC Section 11B-404.2.10**
- M. The clear opening width for a door shall be 32" minimum. For a swinging doors it shall be measured between the face of the door and the stop, with the door open 90 degrees. There shall be no projections into it below 34" and 4" maximum projections into it between 34" and 80" above the finish floor or ground. Door closers and stops shall be permitted to be 78" minimum above the finish floor or ground. **CBC Section 11B-404.2.3**
- N. Handles pulls, latches, locks, and other operable parts on accesible doors shall comply with **CBC Section 11B-309.4** and shall be operable with one hand and shall not require

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tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34" minimum and 44" maximum above finish floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides. **CBC Section 11B-404.2.7**

- O. The force for pushing or pulling open a door shall be as follows: **CBC Section 11B-404.2.9**
  - 1. Interior hinged doors, sliding or folding doors: **5 pounds(22.2N)** maximum. Required fire doors: the minimum opening force allowable by the DSA authority, not to exceed **15 pounds (67N)**. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.
  - 2. The force required for activating any operable parts, such as lever hardware, or disengaging other devices shall be 5 pounds(22.2 N)maximum to comply with CBC Section 11B-309.4
- P. Door closing speed shall be as follows: **CBC Section 11B-404.2.8**
  - 1. Closer shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is **5 seconds min.**
  - 2. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is **1.5 seconds minimum.**
- Q. Thresholds shall comply with **CBC Section 11B-404.2.5**
- R. Floor stops shall not be located in the path of travel and 4" maximum from walls. **DSA Policy 99-08.**
- S. Hardware (including panic hardware) shall not be provided with "Night Latch" (NL) function for any accessible doors or gates unless the following conditions are met per **DSA Interpretation 10-08 DSA/AC (External), revised 4/28/09.** Such conditions must be clearly demonstrated and indicated in the specifications:
  - 1. Such hardware has a 'dogging' feature.
  - 2. It is dogged during the time the facility is open.
  - 3. Such 'dogging' operation is performed only by employees as their job function(non-public use).
- T. Pair of doors: limit swing of one leaf to 90 degrees so that a clear floor space is provided beyond the arc of the swing for the wall-mounted tactile sign. **CBC Section 11B-703.4.2.1**

## 2.04 FINISHES

- A. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.
- B. Surface Preparation: Clean surfaces according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 1. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- C. Primer Application: Apply zinc-rich epoxy primer immediately after cleaning, to provide a minimum dry film thickness of 2 mils (0.05 mm) per applied coat, to surfaces that will be exposed after assembly and installation, and to concealed surfaces.
- D. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.

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1. Match approved Samples for color, texture, and coverage. Remove and refinish, or recoat work that does not comply with specified requirements.
- E. Powder Coating: Immediately after cleaning, apply 2-coat finish consisting of epoxy primer and TGIC polyester topcoat, with a minimum total dry film thickness of not less than 8 mils (0.20 mm). Comply with coating manufacturer's written instructions.
  1. Color and Gloss: Standard black gloss.

## 2.05 MISCELLANEOUS MATERIALS

- A. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Division 3 Section "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi (20 MPa), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum aggregate size or dry, packaged, normal-weight concrete mix complying with ASTM C 387 mixed with potable water according to manufacturer's written instructions.
- B. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 and specifically recommended by manufacturer for exterior applications.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.
  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.

### 3.02 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 200 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, property monuments, property lines, and easements.

### 3.03 PERFORMANCE REQUIREMENTS

- A. All gates shall be designed and constructed to withstand the weight of a 200 pound person standing at the mid-point on the lower rail without permanent deformation of any component members of the assembly.
- B. Fabricator to provide structural calculations for each type gate verifying the performance requirements of this section.

### 3.04 ON THE JOB SITE

- A. After the fence has been erected and is mechanically complete, wire brush field welds, dry wipe off all loose residue, spot prime with the Zinc Chromate all bare metal, bare spots and chips, and unpainted surfaces. Then spray a finish coat over the entire fence installation with one coat of industrial quality coating. Care shall be taken to keep paint off of sidewalks, wall, etc.

### 3.05 FABRICATION AND INSTALLATION

- A. Fencing shall be welded and have smoothed, clean, slag free welds. Dimensions and installation shall be in accordance with the drawings.
- B. The lever of lever actuated latches or locks for an accessible gate shall be curved with a return to within 1/2" of the (face of) gate to prevent catching on the clothing or persons.  
**California Referenced Standards code. T-24 part 12, Section 12-10-202, Item (F).**

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- C. Swing doors and gate surfaces within 10" of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16" of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped.

**CBC Section 11B-404.2.10**

**3.06 POST SETTING**

- A. General: Comply with ACI 301 for cast-in-place concrete.
- B. Materials: Portland cement complying with ASTM C 150, aggregates complying with ASTM C 33, and potable water for ready-mixed concrete complying with ASTM C 94.
  - 1. Concrete Mixes: Normal-weight concrete with not less than 3000-psi (20.7- MPa) compressive strength (28 days), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum size aggregate.
- C. All posts to be set in concrete as detailed on the drawings.
- D. All posts to have concrete domed to shed water. All posts to be set to a maximum of 8 feet O.C. All post to be set plumb, in line, and to correct height. A Corner Post is required when line of fence direction changes 30 degrees or more.
- E. All posts set in existing concrete slabs to be set in a 6 inch core drilled hole and set to a depth of 24 inches. All 6 inch gate posts set in existing concrete slabs are to be set in 12 inch square saw cut to a depth of 43 inches.

**3.07 GROUT AND ANCHORING CEMENT**

- A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by the manufacturer in writing for exterior applications.

**3.08 GATE INSTALLATION**

- A. General: 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.

**3.09 SITE CLEAN UP**

- A. The construction site shall be cleaned up and all accumulated debris removed by the Contractor.

**END OF SECTION**

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## SECTION 323310 ARCHITECTURAL SITE CONCRETE

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Concrete site walls.
- B. Concrete retaining walls.
- C. Concrete cheek walls for exterior concrete stairs.
- D. Concrete benches.
- E. Concrete planters.
- F. Skateboard deterrents.
- G. Light pole bases.
- H. Other architectural site concrete as indicated.

#### 1.02 RELATED REQUIREMENTS

- A. Division 07 Section - Joint Sealants
- B. Division 32 Section - Concrete Paving
- C. Division 32 Section - Concrete Paving Joint Sealants

#### 1.03 DEFINITIONS

- A. Cast-in-Place Architectural Site Concrete: Non-building formed concrete that is exposed to view in completed exterior work and that requires concrete materials, formwork, placement, or finishes to obtain specified architectural appearance.
- B. Cementitious Materials: Portland cement alone or in combination with one or more of the following: Fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.
- C. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of cast-in-place architectural site concrete.
- D. Reveal: Projection of coarse aggregate from matrix or mortar after completion of exposure operations.

#### 1.04 PREINSTALLATION MEETINGS

- A. Pre-installation 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 cast-in-place architectural site concrete to attend, including the following:
    - a. Contractor's superintendent.
    - b. Independent testing agency responsible for concrete design mixtures.
    - c. District's Representative(s).
    - d. Ready-mix concrete manufacturer.
    - e. Architect's Representative(s)
    - f. Cast-in-place architectural site concrete subcontractor.
    - g. Inspector of Record (IOR).
    - h. Subcontractor for any adjacent work

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2. Review testing and inspection procedures, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction joints, forms and form-removal limitations, reinforcement accessory installation, concrete repair procedures, and protection of cast-in-place architectural site concrete.
3. Contractor to provide meeting minutes for pre-installation conference.

#### 1.05 SUBMITTALS

- A. Product Data: For each type of product.
  1. Proprietary admixtures, pigments, curing compounds, hardeners, sealers, form-release agents, all accessory material, etc.: Indicate compatibility with other materials used.
- B. Samples for Initial Selection: For each type of product, ingredient or admixture requiring color selection.
  1. Submit manufacturer selected range of colors and products for review.
  2. Provide custom colors or samples as required.
  3. Upon selection of color submit 12"X12" sample of material in the specified color/finish for review by the Landscape Architect in addition to the specified mock-ups.
- C. Design Mixtures: Submit proposed mix designs and test data for each class, color, application, and strength of concrete and for each method of placement.
  1. Prepare mix designs on the basis of field experience (preferred) and/or trial mixes, in compliance with California Building Code (CBC), Section 1905A.3.
  2. Prepare mix designs on the basis of field experience (preferred) and/or trial mixes, in compliance with California Building Code (CBC), Section 1905.3.
  3. Mix designs shall be prepared and signed by a structural or civil engineer registered in the State of California.
    - a. Mix designs shall be reviewed by the Architect and Structural Engineer of Record (SEOR).
  4. Identify for each mix design submitted the method by which proportions have been selected.
    - a. For mix designs based on field experience, include individual strength test results, standard deviation, and required average compressive strength calculations.
    - b. For mix designs based on trial mixtures, include trial mix proportions, test results, graphical analysis and show required average compressive strength face results. Provide gross weight and yield per cubic yard of trial mixes.
    - c. Indicate quantity of each ingredient per cubic yard of concrete.
    - d. Indicate type and quantity of admixtures proposed or required.
    - e. Indicate water to cement ratio by weight.
    - f. Measured slump.
    - g. Measured air content.
    - h. Provide shrinkage test results.
    - i. no fly ash will be permitted
  5. Submit proposed alternate design mixtures for review by the Architect [and SEOR] when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

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6. Mix designs for each application must be from a single source for the duration of the project. Multiple vendors or courses will not be permitted.
  7. All mix designs must be wet stamped by a licensed Structural Engineer.
- D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
1. Coordinate with and identify the details of the Contract Drawings on the shop drawings.
  2. Comply with ACI 315, part B and CRSI requirements.
- E. Formwork Shop Drawings: Show formwork construction including form-facing joints, rustications, construction and contraction joints, form joint-sealant details, form tie locations and patterns, inserts and embedments, cutouts, cleanout panels, and other items that visually affect cast-in-place architectural site concrete.
1. Engineering Responsibility: Formwork shop drawings shall be prepared by or under the supervision of a licensed professional engineer detailing fabrication, assembly, and support of formwork.
  2. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
  3. Location of form ties and patterns are subject to approval of the Landscape Architect. For walls less than 18" high, ties to be located above and below wall face, whenever possible.
  4. Align all form joints with reveal locations indicated on plans. Provide custom size and cut form boards as required.
- F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure. Submit dimensioned drawing indicating layout of construction joints, contraction (control) joints, dowelled joints, decorative scoring and placement sequence of concrete.
1. Location of construction joints are subject to approval of the Architect.
  2. Construction joints locations should align with reveal locations as located per drawings.
  3. Provide custom form boards as required for joint alignment noted per drawings.
  4. Align all form joints with reveal locations indicated on plans. Provide custom size and cut form boards as required.
- G. Placement Schedule: Submit concrete placement schedule before start of placement operations. Include locations of all joints including construction joints.
- H. Samples: For each of the following materials:
1. Form-facing panel.
  2. Form ties.
  3. Form liners.
  4. Coarse- and fine-aggregate gradations.
  5. Chamfers
  6. Reveals
  7. One-half c.f. sample of sand and fine aggregate
  8. On-half c.f. sample of coarse aggregate



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- I. Samples for Verification: Architectural site concrete Samples, cast vertically, approximately 18" by 18" by 2 inches (450 by 450 by 50 mm), of each finishes, colors, and textures to match design reference sample. Include Sample sets showing the full range of variations expected in these characteristics.
- J. Qualification Data: For manufacturer (batch plant).
- K. Welding Certificates: Submit certifications signed by AWS Certified Welding Inspector of prequalified welding procedures, qualifications of welding procedures unless prequalified, qualifications of welding operators and qualifications of welders.
- L. Material Certificates: For each of the following:
  - 1. Cementations materials.
  - 2. Aggregates and sand.
  - 3. Admixtures.
  - 4. Form materials and form-release agents.
  - 5. Steel reinforcement and accessories.
    - a. Provide mill test certificates for all reinforcing steel, showing physical and chemical analyses. For steel that will be welded, include in the chemical analysis the percentages of carbon, manganese, copper, nickel, chromium, phosphorus and sulfur, and optionally, the percentages of molybdenum and vanadium.
  - 6. Curing compounds.
  - 7. Surface treatments.
  - 8. Bonding agents.
  - 9. Adhesives.
  - 10. Semi rigid joint filler.
  - 11. Joint-filler strips.
  - 12. Repair materials.
  - 13. Sack finish material.
- M. Material Test Reports: For the following, by a qualified testing agency:
  - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- N. Field Quality-control Reports. Submit reports of all compressive strength, slump, shrinkage and air content tests required by the authorities having jurisdiction and as indicated.
  - 1. Submit copies of delivery tickets complying with ASTM C 94 for each load of concrete delivered to the site. Tickets shall include all information required by the referenced standard.
- O. Minutes of pre-installation conference.

#### 1.06 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with CBC Chapter 19A.
  - 1. Chemical products field-applied to concrete shall comply with the air quality requirements of authorities having jurisdiction.
- B. Industry Standards: Comply with the following unless modified by requirements in the Contract Documents.
  - 1. ACI 301, "Specifications for Structural Concrete".
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials".

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3. ACI 302.1R, "Guide for Concrete Floor and Slab Construction".
  4. ACI 303.1 "Specifications for Cast-in-Place Architectural Concrete".
  5. ACI 304R, "Guide for Measuring, Mixing, Transporting, and Placing Concrete".
  6. ACI 305R, "Hot Weather Concreting".
  7. ACI 306.1, "Standard Specification for Cold Weather Concreting".
  8. ACI 318, "Building Code Requirements for Structural Concrete".
  9. ACI 347, "Guide to Formwork for Concrete".
  10. ACI 318, "Building Code Requirements for Structural Concrete."
  11. ACI SP-66, "ACI Detailing Manual".
  12. CRSI, "Manual of Standard Practice".
  13. CRSI, "Placing Reinforcing Bars".
- C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "NRMCA Quality Control Manual - Section 3, Certification of Ready Mixed Concrete Production Facilities."
  2. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
  3. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
  4. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations for Cast-in-Place Architectural Site Concrete: Obtain each color, size, type, and variety of concrete material and concrete mixture from single manufacturer with resources to provide cast-in-place architectural site concrete of consistent quality in appearance and physical properties for the duration of the project.
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specification for Structural Concrete,"[Sections 1 through 5.] [Sections 1 through 5 and Section 6, "Architectural Concrete."]
  2. ACI 303.1, "Specification for Cast-in-Place Architectural Concrete."
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- G. Source Limitations for Concrete Paving: Obtain each color, size, type, and variety of concrete material and concrete mixture from single manufacturer with resources to provide concrete of consistent quality in appearance and physical properties. Secure all material required for the duration of the project as needed to ensure consistent quality in appearance
- H. Welding Qualifications: Comply with CBC Chapter 17A.
1. Qualify welding procedures and welding personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel" prior to performing any welding.

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2. Qualify welding inspection personnel according to AWS QC1, "Standard for AWS Certification of Welding Inspectors."
- I. Welding Qualifications: Comply with CBC Chapter 17.
  1. Qualify welding procedures and welding personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel" prior to performing any welding.
  2. Qualify welding inspection personnel according to AWS QC1, "Standard for AWS Certification of Welding Inspectors."
- J. Mockups: Before casting architectural site concrete, build mockups to verify selections made under Sample submittals and to fully demonstrate typical joints, surface finish, texture, tolerances, reveals edges, bulkhead or cold joints, standard of workmanship and completed product. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
  1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
  2. Build mockups full-size, matching architectural site concrete components indicated on the Drawings. Mock-ups shall be complete in every detail, including joints, reveals, chamfers, etc. Include complex joinery conditions where necessary to integrate to other Project components as indicated.
  3. Maintain accurate records of variables associated with each mockup to facilitate the matching of accepted mockups during actual construction.
  4. Demonstrate curing, cleaning, and protecting of cast-in-place architectural site concrete, finishes, and contraction and expansion joints, as applicable.
  5. Required Mockup Types:
    - a. Walls: Construct at least 6 linear feet by 4 foot by 12" wide height of finished concrete site walls for each color, finish, and mix design.
    - b. Benches and Seats: Construct at least 6 linear feet of finished concrete site benches and seats.
    - c. Planters: Construct at least 6 linear feet by 18" height by 12" wide of finished concrete site planters.
    - d. Amphitheaters and Steps: Construct at least 6 linear feet of finished concrete steps/amphitheaters by 3 risers minimum.
    - e. Abrasive-Blast Finishes: Mockups shall clearly demonstrate 3 levels of depth-of-cut for abrasive-blast finishes for Architect's review.
    - f. Repairs: In presence of Architect, damage part of the exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes, honeycombing, spalls, surface blemishes, etc. to match adjacent undamaged surfaces.
  6. Mockup Acceptance: Obtain Architect's approval of mockups before casting architectural site concrete.
    - a. The Architect may reject mockups that, in the Architect's sole judgment, do not demonstrate an acceptable completed product, including, but not limited to, color, joint work, surface finish, texture, tolerances, and standard of workmanship
    - b. The Architect may require modifications to mockups to obtain acceptable results.
    - c. The Architect may require modifications to mockup repairs to obtain acceptable results.

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- d. The Architect may require removal and reconstruction of mockups to obtain acceptable results. Multiple mock ups may be required.
- e. Contractor shall provide additional mockups as required to obtain results acceptable to the Architect at no additional cost to the Owner.
- 7. Mockup Disposition: Accepted mockups shall not become part of the completed Project. Maintain mock-up on-site for the duration of construction and until all work has been accepted. Remove and legally dispose mockups after acceptance of final installed work. If sufficient permanent architectural site work has been completed, Contractor may submit a written request to Architect to transfer quality control for architectural site concrete from the accepted mockups to one or more designated portions of the permanent work.

#### 1.07 PROJECT CONDITIONS:

- A. Traffic Control: Maintain access for Owner's operations and for vehicular and pedestrian control required for construction activities.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
  - 1. Label bundles with durable identification tags. Maintain reinforcement identification after bundles are broken.
  - 2. Store reinforcement to avoid excessive rusting or fouling with grease, oil, dirt or other bond-weakening contaminants.
  - 3. Avoid damaging applied coatings, if any, on steel reinforcement.

### PART 2 - PRODUCTS

#### 2.01 FORM-FACING MATERIALS

- A. General: Comply with Division 03 Section "Cast-in-Place Concrete" for formwork and other form-facing material requirements.
- B. Form-Facing Panels for As-Cast or Exposed-Aggregate Finishes: Steel, glass-fiber-reinforced plastic, or other approved non-absorptive panel materials that will provide continuous, true, and smooth architectural site concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- C. Form-Facing Panels for all exposed As-Cast and Exposed-Aggregate Concrete Finishes: Provide steel, glass-fiber-reinforced plastic, or overlain exterior-grade plywood panels, non-absorptive, that will provide continuous, true, and smooth architectural site concrete surfaces, with no wood grain, honeycombing or patch transfer.
  - 1. Faced plywood panels shall comply with, or be equivalent to, DOC PS 1, Structural I. Provide minimum 7-ply plywood and provide balance sheets for panels coated one-side only. Furnish in largest practicable sizes to minimize number of joints.
    - a. Smooth As-Cast Finish: High-Density Overlay (HDO). Provide one of the following panels, or comparable substituted product:
      - 1) Olympic Panel Products, "Multipour Concrete Form." Overlay Color: Buff.
      - 2) Pacific Laminate Products, "ProFace HDO." Overlay Color: White.
      - 3) Sylvan Products, LLC, "Armor Ply HDO" Overlay Color: Buff.
- D. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent surface treatments of concrete.

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- E. Rustication Strips or Reveals: Wood, metal or rigid plastic, with sides beveled and back kerfed; nonstaining; in longest practicable lengths. Align reveals as shown on plans and with form seams.
- F. Form Joint Tape: Compressible foam tape; pressure sensitive; AAMA 800, "Specification 810.1, Expanded Cellular Glazing Tape"; minimum 1/4 inch (6 mm) thick.
- G. Form Joint Sealant: Urethane or silicone elastomeric sealant complying with ASTM C 920, Type M or Type S, Grade NS that adheres to form joint substrates. Form joint sealant shall be compatible with form-facing panels.
- H. Form Sealer: Penetrating, clear, polyurethane wood form sealer formulated to reduce absorption of bleed water and prevent migration of set-retarding chemicals from wood. Form sealer shall be compatible with form-facing panels. All seams and joints are to be sealed.
- I. Form-Release Agent: Commercially formulated, colorless form-release agent that will not bond with, stain, or adversely affect architectural site concrete surfaces and will not impair subsequent treatments of those surfaces. Form-release agent shall be compatible with form-facing panels.
  - 1. Obtain written acceptance of form release agent from integral colored concrete pigment manufacturer.
  - 2. Form-release agents shall be non-staining.
  - 3. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- J. Form Ties: Factory-fabricated, stainless steel or fiberglass color keyed to wall color snap ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  - 1. Furnish ties with tapered plastic tie cone spreaders that, when removed, will leave holes 3/4 inch in diameter on concrete surface.
- K. Provide new forms specifically purchased for this project. Reuse of forms from past projects or contractors stock will not be accepted.
- L. Provide custom form boards as required to align seams with reveals indicated on plans.

## 2.02 STEEL REINFORCEMENT AND ACCESSORIES

- A. General: Comply with Division 03 Section "Cast-in-Place Concrete" for steel reinforcement and other requirements for reinforcement accessories.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 60 percent.
- C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed, unless otherwise indicated.
- D. Low-Alloy-Steel Reinforcing Bars (for Welding): ASTM A 706/A 706M, Grade 60, deformed, unless otherwise indicated.
- E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place; manufacture according to CRSI's "Manual of Standard Practice."
  - 1. Where legs of wire bar supports contact forms, use CRSI Class 2, stainless-steel bar supports.
- F. Tie Wire: Minimum 16 ga. annealed wire, black, galvanized or coated finish to match rebar.

## 2.03 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

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1. Portland Cement: ASTM C 150, Type II, or Type IV, gray, unless white cement is required to achieve colors indicated. Supplement with the following:
- B. Normal-Weight Aggregates: ASTM C 33, Class 5S coarse aggregate or better, graded. Provide aggregates from single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials].
- C. Normal-Weight Aggregates: ASTM C 33, complying with building code. Provide aggregates from a single source. All aggregates shall be free of materials with deleterious reactivity to alkali in cement when tested in accordance with ASTM C 289.
  1. Comply with CBC section 1903A.3.
  2. Comply with CBC section 1903.3.
    - a. Service Class, based on CBC Figure 1904A.2.2, "Weathering Probability Map":
      - b. Severe and Moderate: Class 5S.
      - c. Negligible: Class 2N.
  3. Maximum Coarse-Aggregate Size: 3/8 inch nominal. Maximum size shall also not be larger than 1/4 of the narrowest dimension between forms, 1/3 the depth of slab nor more than 3/4 of the minimum clear spacing between individual reinforcing bars.
    - a. Gradation: Uniformly graded.
- D. Normal-Weight Fine Aggregate: ASTM C 33 or ASTM C 144, manufactured or natural sand, from same source for Project, free of materials with deleterious reactivity to alkali in cement and free of materials which may cause staining and light in color
  1. Color to be white to light with no dark material.
- E. Water: Potable, complying with ASTM C 94/C 94M except free of wash water from mixer washout operations.

#### 2.04 ADMIXTURES

- A. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use calcium chloride or admixtures containing calcium chloride.
  1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
- B. Shrinkage-Reducing Admixture: Commercially formulated, shrinkage inhibitor capable of reducing initial shrinkage by 80% and long-term shrinkage by 50%. Provide product suitable for use with either air-entrained or non-air-entrained concrete as appropriate to structural member and project location.
  1. Products: Subject to compliance with requirements, provide one of the following(as required):
    - a. Euclid Chemical Company (The), an RPM company; EUCON SRA, SRA+.
    - b. Grace Construction Products, W. R. Grace & Co.; Eclipse Floor, Eclipse Plus.
    - c. Sika Corporation; Control 40.

#### 2.05 CURING MATERIALS

- A. Clear, Waterborne (Non-Colored Concrete): Provide products complying with ASTM C 309, Type 1, Class B, 18 to 25 percent solids, certified by curing compound manufacturer to not

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interfere with bonding of sealers, with no glossy finish and compatible with specified sealer. Provide products with not more than 100g/L volatile organic content.

1. Products: Subject to compliance with requirements.
- B. Clear, Waterborne (Colored Concrete): Provide products that are acceptable to concrete color pigment manufacturer complying with ASTM C 309, Type 1, Class B, 18 to 25 percent solids, certified by curing compound manufacturer to not interfere with bonding of sealers with no glossy finish and compatible with specified sealer. Provide products with not more than 100g/L volatile organic content.
  1. Products: Subject to compliance with requirements.
- C. Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
  1. For integrally colored concrete, curing compound shall be approved by color pigment manufacturer.
  2. For concrete indicated to be sealed, curing compound shall be compatible with sealer.

## 2.06 SEALERS AND WATER REPELLENTS

- A. Penetrating Liquid Floor and Horizontal Surface Treatment (Sealer): Clear, chemically reactive, water-based lithium quartz water-based lithium materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces. Materials shall be compatible with concrete admixtures and shall be recommended by manufacturer for intended use. Provide products with 0g/L volatile organic content.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Sinak Corporation; Concrete Sealer HLQ 125.
- B. Penetrating Liquid Wall and Vertical Surface Treatment (Repellent): Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces. Materials shall be compatible with concrete admixtures and shall be recommended by manufacturer for intended use. Provide products with less than 100g/L volatile organic content.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. L&M Construction Chemicals, Inc.; Hydropel WB
    - b. ProSoCo Inc.; SL100 Water Repellent
    - c. Rainguard International; Microseal(For use with VandlGuardTEN Anti-graffiti coating)

## 2.07 ANTI-GRAFFITI COATING

- A. Refer to Section 099620 Permanent Non-Sacrificial Anti-Graffiti Coating for product and specific sealer.

## 2.08 JOINT DEVICES, FILLER MATERIALS AND OTHER ACCESSORY PRODUCTS

- A. Joint Filler at Exterior Sealed Joints: ASTM D 1751
  1. 1/4" asphalt-saturated cellulosic fiber.
  2. Exterior Expansion- and Isolation-Joint-Filler Strips: See Division 32 Section "Concrete Paving Joint Sealants" for sealants for exterior joints at concrete pavements.

## 2.09 REPAIR MATERIALS

- A. General: Provide cementitious materials, coarse aggregates, fine aggregates, water, bonding agents and admixtures as required to prepare repair grouts that will match as-cast and site finished architectural site concrete.

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1. Maintain accurate records of repair materials and mixtures used on accepted mockups.
- B. Bonding Agent: ASTM C 1059, Type II, non-re-emulsifiable. Provide proprietary products composed of latex polymers.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. W.R. Meadows, Inc.; Acry-Lok.
    - b. Grace Construction Products, W. R. Grace & Co.; "Daraweld C".
    - c. Larsen Products Corp., "Weld-Crete".
  2. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements.
  3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete and for anchoring dowels to hardened concrete.

## 2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of cast-in-place architectural site concrete proportioned on basis of laboratory trial mixture or field test data, or both, according to ACI 301.
  1. Use a qualified independent testing agency for preparing and reporting proposed design mixtures based on laboratory trial mixtures.
  2. Proportioning:
    - a. The proportioning of ingredients shall be such that the concrete can be readily worked into forms and around reinforcement under the conditions of placement to be used, without segregation or excessive bleeding.
    - b. When proportioning by weight of loose, dry material, 94 pounds of cement shall be considered 1 cubic foot.
    - c. Fine aggregate volume shall be at least 35 percent, with a maximum of 50 percent, of the sum of the separate fine and coarse aggregate volumes.
    - d. Total water content shall not exceed 35 gallons per cubic yard of concrete.
    - e. Weighing equipment shall be accurate within 1 pound and shall be adjustable for varying aggregate moisture content.
    - f. A beam auxiliary shall register any part of the last 100 pounds of each aggregate. The aggregate hopper shall have a volume adjustment.
  3. Prepare compressive strength data for both 7-day and 28-day strengths.
    - a. The 7-day compressive strength shall be at least 60 percent of the required 28-day strength.
    - b. The 28-day compressive strength shall be as indicated.
  4. Provide drying shrinkage test data at 28 days, from not less than 3 test specimens.
- B. Proportion concrete mixtures as follows:
  1. Minimum Compressive Strength (28 Days): 3500 psi.
  2. Maximum Water-Cementitious Materials Ratio: 0.50
  3. Slump Limit: 7 inches, plus or minus 1 inch, unless indicated otherwise.
- C. Slump Limit: 7 inches (100 mm) for concrete with verified slump of 6 to 8 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture], plus or



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minus 1 inch (25 mm), unless otherwise indicated.

- D. Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement. Limit total chloride-ion content in hardened concrete to 0.10 percent by weight of concrete when tested per AASHTO T 260 potentiometric titration.
  - 2. Limit "drying shrinkage" after 28 days of curing hardened concrete to 0.045 percent of the original concrete volume.
  - 3. Admixtures: Admixtures may only be used if they are incorporated into the accepted concrete mix designs. Use admixtures according to manufacturer's written instructions.
    - a. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

## 2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
  - 1. Splices: Do not splice bars, unless indicated on the Drawings.
  - 2. Staggered Splices: Stagger splices such that not more than one-half of the reinforcing bars are spliced at any location.

## 2.12 CONCRETE MIXING

- A. Ready-Mixed Architectural Site Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M [and ASTM C 1116/1116M] and furnish batch ticket information.
  - 1. Clean equipment used to mix and deliver cast-in-place architectural site concrete to prevent contamination from other concrete.
  - 2. When air temperature is between 85 and 90 deg. F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg. F, reduce mixing and delivery time to 60 minutes.
  - 3. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
  - 4. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  - 5. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 60 seconds for each additional 1 cu. yd. (0.76 cu. m).
  - 6. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

## PART 3 - EXECUTION

### 3.01 FORMWORK

- A. General: Comply with the following, unless otherwise indicated:
  - 1. Conform to ACI 318, ACI 347 and CBC Section 1906.
  - 2. Conform to ACI 318, ACI 347 and CBC Section 1906A.
- B. Structural Loads: Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

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- C. Geometry: Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117. Provide for necessary openings, inserts, anchorages, and other features indicated or required. Properly locate all elements.
  - 1. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
    - a. Class A, 1/16 or 1/8 inch for smooth-formed finished surfaces.
    - b. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.
- D. Form Joints: Minimize form joints and make forms watertight to prevent leakage of concrete mortar. Locate form joints at exposed concrete symmetrically about center of panel and aligned with reveals, unless otherwise indicated. Align joints symmetrically at exposed conditions.
  - 1. Seal penetrations at form ties with form joint sealant to prevent cement paste leakage.
  - 2. Provide custom form boards as required to align with reveals.
- E. Removal: Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where dismantling or stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 1. Install keyways, reglets, recesses, and the like, for easy removal.
  - 2. Do not use rust-stained steel form-facing material.

### 3.02 CONSTRUCTED FORMWORK

- A. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- B. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- C. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- D. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- E. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- F. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- G. Provide bracing and shores to ensure stability of formwork and accommodate all loads. Use form ties of sufficient strength and in sufficient quantities to prevent formwork spreading. Maintain principal shores to support concrete until required strength is achieved.

### 3.03 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install embedded accessories level, true-to-line and plumb in accordance with manufacturer's instructions.

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2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
3. Provide reveals around embedded items such as light fixtures as shown on Drawings.

### 3.04 OPENINGS, DEPRESSIONS, RECESSES AND CHASES

- A. Size and locate formed openings, depressions, recesses and chases to accommodate products to be applied to, built-into and/or pass-through concrete Work. Coordinate size, location and placement of inserts, embedded products, openings and recesses with Work of other sections. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

### 3.05 FORM RELEASE AGENTS

- A. General: Provide either form materials with factory-applied non-absorptive liner or field-applied form coating. Field-applied coating shall be non-staining.
  1. Non-absorptive Liner: Rust on steel form surfaces is not acceptable.
  2. Field Applied Coating: Comply with manufacturer's written instructions. Obtain written acceptance of form release agent from integral colored concrete pigment manufacturer.
    - a. Reapply coating to thoroughly cleaned and reconditioned formwork before each use.
    - b. Verify compatibility of release agents with integrally-colored concrete and all subsequently applied curing compounds, coatings, applied finishes, etc. Do not apply release agent if items are non-compatible.
    - c. Do not apply release agent where decorative wood graining is intended for concrete surface. Leave form face dry.

### 3.06 CONCRETE SURFACE RETARDERS

- A. Coat contact surfaces of forms with surface retarder, according to manufacturer's written instructions, before placing reinforcement.

### 3.07 FORM LINERS

- A. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and attach securely to prevent deflection and maintain stability of liners during concreting. Prevent form liners from sagging and stretching in hot weather. Seal joints of form liners and form liner accessories to prevent mortar leaks. Coat form liner with form-release agent.

### 3.08 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg. F for 72 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
  1. Schedule form removal to maintain surface appearance that matches accepted mockups.
  2. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved its 28-day design compressive strength, but not less than 21 days after pour.

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3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
  4. All formwork is to be new specifically purchased for this project.
- B. Clean and repair surfaces of forms to be reused in the Work in non-exposed areas. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### 3.09 STEEL REINFORCEMENT

- A. General: Place and secure reinforcement as indicated. Comply with CRSI publications "Manual of Standard Practice" and "Placing Reinforcing Bars".
1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
  2. Do not bend bars more than once.
  3. Do not bend or straighten reinforcement in a manner injurious to the material, such as heating.
  4. Do not use bars with kinks or bends not indicated.
  5. Do not use bars with reduced cross-section due to corrosion or other cause.
  6. Remove and replace all defective bars.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Space reinforcement as indicated. If not indicated, maintain clear spacing of not less than the bar diameter, 1-inch, or 1-1/3 times the maximum aggregate size, whichever is greater. Where parallel reinforcing is placed in more than one horizontal layer, place as many bars as possible in the outboard layer, maintaining the required lateral clearances and spacing's. Place bars in the inboard layer in direct vertical alignment with the bars of the outboard layer. Maintain not less than 1-inch or the maximum bar diameter in the inboard/outboard layers, whichever is greater, clear space between vertically stacked bars.
- D. Accurately position, support, and secure reinforcement against displacement.
1. Maintain reinforcing steel positions during placement operations. Properly reset any reinforcement that is displaced by runways, workmen and other causes.
- E. Locate and support reinforcement with bar supports to maintain minimum concrete cover as indicated or as required by ACI 318.
- F. Do not tack weld crossing reinforcing bars.
1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- G. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- H. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

### 3.10 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction or Cold Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

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1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  2. Locate horizontal joints in walls and columns as indicated.
  3. Space vertical joints in walls as indicated and as may be directed by the Architect. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
  4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  5. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  6. Align joints with reveals indicated. Provide custom cut form boards as required.
  7. Do not place expansion material at cold joints.
- C. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, walls and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
  2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
  3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

### 3.11 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, form-release agent, surface retarders, reinforcement, and embedded items is complete and that required inspections have been performed.
1. Provide protective coatings, coverings and masking's to protect adjacent Work.
  2. Provide temporary runways and other appropriate equipment as necessary to access Work area and to avoid soiling or damage to existing Work.
  3. Prevent run-off of concrete hydration water and water polluted by agents and chemicals from soiling existing surfaces or contaminating landscape areas.
- B. Do not add water to concrete during delivery, at Project site, or during placement.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
  2. If indicated in mix design accepted by the Architect, water added to concrete shall be observed by the Project Inspector, and shall be recorded on the delivery ticket.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. Deposit concrete continuously between construction joints. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

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2. No visible cold joints or lift lines are acceptable in the completed work.
  3. Consolidate placed concrete with mechanical vibrating equipment according to ACI 303.1.
  4. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. Do not permit vibrators to contact forms. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
  5. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  6. Maintain reinforcement in position on chairs during concrete placement.
  7. Screed slab surfaces with a straightedge and strike off to correct elevations.
  8. Slope surfaces uniformly to drains where required.
  9. Begin initial floating using bull floats or derbies to form a uniform and open-textured surface plane, before excess bleed water appears on the surface.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg. F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  3. Do not use calcium chloride, salt, or other materials containing antifreeze agents.
  4. Do not use chemical accelerators unless otherwise specified and accepted in design mixtures.
- F. Hot-Weather Placement: Comply with ACI 305R and as follows:
1. Maintain concrete temperature below 90 deg. F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.12 FINISHES, GENERAL

- A. Architectural Site Concrete Finishes: Match Architect's design reference sample, identified and described as indicated, to satisfaction of Architect.
- B. Architectural Site Concrete Finishes: Match accepted mockups to satisfaction of Architect.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces.
  1. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.
- D. Maintain uniformity of special finishes over construction joints unless otherwise indicated.

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### 3.13 AS-CAST FORMED FINISHES

- A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Remove fins and other projections exceeding specified limits on formed-surface irregularities. Repair and patch tie holes and defects to match the accepted mockups. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding specified limits on formed-surface irregularities.
- B. Smooth-Formed Finish is the general finish required for all formed integral-colored concrete, unless otherwise indicated. Rubbed finishes are unacceptable.
- C. Rubbed Finish: Apply the following to smooth-form-finished as-cast concrete where indicated:
- D. Smooth-Rubbed or Sponged Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- E. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part Portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match surrounding concrete. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
- F. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part Portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match surrounding concrete. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- G. Form-Liner Finish: Produce a textured surface free of pockets, streaks, and honeycombs, and of uniform appearance, color, and texture.

### 3.14 EXPOSED-AGGREGATE FINISHES

- A. Scrubbed Finish: After concrete has achieved a compressive strength of from 1000 to 1500 psi (6.9 to 10.3 MPa), apply scrubbed finish. Wet concrete surfaces thoroughly and scrub with stiff fiber or wire brushes, using water freely, until top mortar surface is removed and aggregate is uniformly exposed. Rinse scrubbed surfaces with clean water. Maintain continuity of finish on each surface or area of Work. Remove only enough concrete mortar from surfaces to match design reference sample or mockup.
- B. High-Pressure Water-Jet Finish: Perform high-pressure water jetting on concrete that has achieved a minimum compressive strength of 4500 psi (31 MPa). Coordinate with formwork removal to ensure that surfaces to be high-pressure water-jet finished are treated at same age for uniform results.
  - 1. Surface Continuity: Perform high-pressure water-jet finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work. Maintain required patterns or variances in reveal projection to match design reference sample or mockup.
- C. Abrasive Blast Finish: Perform abrasive blasting after compressive strength of concrete exceeds 2000 psi and is at least 28 days old. Coordinate with formwork removal to ensure that the surfaces to be abrasive blasted are treated at same age for uniform results.

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1. Surface Continuity: Perform abrasive-blast finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work. Maintain required patterns or variances in depths of blast to match design reference sample or mockup.
2. Abrasive Blasting: Abrasive blast corners and edges of patterns carefully, using backup boards, to maintain uniform corner or edge line. Determine type of nozzle, nozzle pressure, and blasting techniques required to match design reference sample or mockup.
3. Depth of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surfaces to match design reference sample or mock up as follows:
4. Depth of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surfaces to match design reference sample or mockup, as follows:
  - a. Brush: Remove cement matrix to dull surface sheen and expose face of fine aggregate; with no significant reveal.
  - b. Light: Expose fine aggregate with occasional exposure of coarse aggregate and uniform color; with maximum reveal of 1/16 inch (1.5 mm).
  - c. Medium: Generally expose coarse aggregate; with slight reveal, a maximum of 1/8 inch (3 mm).
  - d. Heavy: Expose and reveal coarse aggregate to a maximum projection of one-third its diameter; with reveal range of 1/4 to 5/16 inch (6 to 8 mm).

### 3.15 SKATEBOARD DETERRENTS

- A. General: Install skateboard deterrents in epoxy adhesive supplied by manufacturer, in accordance with manufacturer's instructions.
  1. Install as shown. If not shown, install in symmetrical fashion on all formed edges within 4 feet (1.22 m) of adjacent grade, at intervals not to exceed 3 feet (1.1 m) O.C.

### 3.16 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 305R for hot-weather protection during curing.
- B. Begin curing cast-in-place architectural site concrete immediately after removing forms from concrete or after applying as-cast formed finishes to concrete, consistent with mockup preparation. Cure according to ACI 308.1, by one or a combination of the following methods that will not mottle, discolor, or stain concrete:
  1. Moisture Curing: Keep exposed surfaces of cast-in-place architectural site concrete continuously moist for no fewer than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  2. Curing Compound: Mist concrete surfaces with water. Apply curing compound uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.



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### 3.17 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with the CBC and ACI 301.
  - 1. Comply with the requirements of Division 01 Section "Quality Control".
  - 2. Comply with the requirements of Division 01 Section "Quality Control-DSA".
- B. Inspections:
  - 1. Steel reinforcement placement.
  - 2. Steel reinforcement welding.
  - 3. Headed bolts and studs.
  - 4. Verification of use of required design mixture.
  - 5. Structural concrete placement, including conveying and depositing.
  - 6. Curing procedures and maintenance of curing temperature.
  - 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  - 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
  - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg. F and below and when 90 deg. F and above, and one test for each composite sample.
  - 5. Compression Test Specimens: ASTM C 31/C 31M.
    - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
  - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    - a. Test one set of two field-cured specimens at 7 days and reserve one set of two specimens for testing at 56 days.
    - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

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7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

### 3.18 DEFECTIVE CONCRETE

- A. The following list includes, but is not limited to; concrete that will be deemed to be defective and non-conforming. All such concrete shall be removed and replaced with Work complying with the requirements of the Contract:
  1. Concrete not formed as indicated, not true to alignment indicated, not plumb where intended, not level where intended, not true to level or elevation intended.
  2. Concrete voided or honeycombed, including voids and honeycombs that have been cut, resurfaced or filled without prior approval of the Architect.
  3. Concrete with exposed reinforcement.
  4. Concrete with inadequate cover over reinforcement.
  5. Concrete with embedded foreign objects and debris, including sawdust, wood or metal shavings, nails, cans, trash, etc.
  6. Concrete that does not visually match the accepted mockups [or the designated design reference sample].
  7. Other non-conforming work.
- B. All concrete deemed to be defective by the Architect or in non-conformance with the contract documents is to be removed and replaced from expansion joint or cold joint to expansion joint or cold joint at no cost to the owner. Repair defective concrete as directed by the Architect, at no cost to the Owner.

### 3.19 SEALERS AND REPELLENTS

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- A. General: Uniformly apply a continuous sealing coat of sealers or repellents to all exposed surfaces of architectural site concrete by power spray or roller according to manufacturer's written instructions.
  - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
  - 2. Do not apply to concrete that is less than 28 days old.
- B. Penetrating Liquid Floor and Horizontal Surface Treatment (Sealer): Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
  - 1. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- C. Penetrating Liquid Wall and Vertical Surface Treatment (Sealer/Repellent): Prepare, apply, and finish penetrating liquid repellent treatment according to manufacturer's written instructions.

### 3.20 ANTI-GRAFFITI COATING

- A. Refer to Section 099620 Permanente Non-Sacrificial Anti-Graffiti Coating.
- B. Apply to all exposed architectural site concrete.
- C. Apply compatible sealer to exposed architectural site concrete prior to installation of Anti-Graffiti coating.

### 3.21 REPAIRS, PROTECTION, AND CLEANING

- A. Patching or sacking of damaged or defective concrete as determined by the Architect is not permitted. Remove and replace all damaged or defective concrete from joint to joint. Remove/Repair and cure damaged or defective finished surfaces of cast-in-place architectural site concrete when accepted by Architect. Match repairs to color, texture, and for any replaced work/uniformity of surrounding surfaces and to repairs on approved mockups.
- B. Remove and replace cast-in-place architectural site concrete that does not match mockups accepted by Architect.
- C. Protect corners, edges, and surfaces of cast-in-place architectural site concrete from damage; use guards and barricades.
- D. Protect cast-in-place architectural site concrete from staining, laitance, and contamination during remainder of construction period.
- E. Clean cast-in-place architectural site concrete surfaces after finish treatment to remove stains, markings, dust, and debris.
- F. Wash and rinse surfaces according to concrete finish applicator's written instructions. Protect other Work from staining or damage due to cleaning operations.
  - 1. Do not use cleaning materials or processes that could change the appearance of cast-in-place architectural site concrete finishes.

**END OF SECTION**

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## IRRIGATION SYSTEM 32 8400

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. The CONTRACTOR shall provide all labor, materials, supplies, tools, and transportation and perform all operations in connection with and reasonably incidental to complete the installation of the automatic sprinkler irrigation systems as shown on the drawings. Items hereinafter are included as an aid to take off, and are not necessarily a complete list of work items.
  - 1. Trenching, stockpiling, excavation, materials, and refilling trenches.
  - 2. Furnishing materials and installation for complete system including piping, valves, fittings, sprinkler heads, automatic controls, and final adjustment of heads to insure complete coverage.
  - 3. Line voltage connections to the irrigation controllers and low voltage control wiring from controllers to remote control valves.
  - 4. Replacement of unsatisfactory materials.
  - 5. Clean-up, inspection and approval.
  - 6. All work of every description mentioned in the specification and/or addenda thereto, all other labor, and materials reasonably incidental to the satisfactory completion of the work, including clean-up of the site, as directed by the Project Representative.
  - 7. Tests.
  - 8. As-built record drawings.
- B. Work Specified Elsewhere:
  - 1. Irrigation water stub-out.
  - 2. 120 volt A.C. electrical stub-out to controller location.
  - 3. Irrigation piping in structure.
  - 4. Irrigation sleeves.
  - 5. Electrical conduit in structure for 24-volt wire.

#### 1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Irrigation System:
  - 1. Measurement: Irrigation system installation is measured on a lump sum basis.
  - 2. Payment: The contract lump sum price paid for the Irrigation System shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing the Irrigation System, complete in place.

#### 1.03 SUBMITTALS

- A. Product Data: Submit manufacturer catalog information on all material to be used on the project as specified on the legend, notes, details and plans. Redline or highlight exact items on page to be submitted. Complete material list shall be submitted prior to performing any work.
- B. Substitutions: No substitution will be permitted without prior written approval by the Project Representative. If the product is approved and, in the opinion of the Project Representative, the substituted product does not perform as well as the specified product, the Contractor shall replace it with the specified product at no additional cost to the Project Representative.
- C. All equipment or materials installed or furnished without prior approval of the Project Representative may be rejected and the Contractor may be required to remove the equipment or material at their own expense.

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#### 1.04 CLOSEOUT SUBMITTALS

- A. Project As-built Record Documents: The Contractor shall maintain in good order in the field office, one complete set of black line prints of all sprinkler drawings which form a part of the contract, showing all water lines, electrical, sprinklers, valves, stub-outs. In the event any work is not installed as indicated on the drawings, such work shall be corrected and dimensioned accurately from the building walls. All underground stub-outs for future connections and valves shall be located and dimensioned accurately from building walls on all as-built record drawings. In addition to the hard copies a full sized scanned PDF will be required at completion.
- B. Controller Chart:
  1. Provide one laminated controller chart showing the area covered by controller for each automatic controller supplied at the maximum size controller door will allow. Chart shall be a reduced drawing of the actual "as-built" system. If controller sequence is not legible when the drawing is reduced to door size, the drawing shall be enlarged to a size that is readable and placed folded, in a sealed plastic container, inside the controller door.
  2. Controller chart shall be a blackline print with a different color used to show area of coverage for each station. Charts must be completed and approved by the Project Representative prior to final inspection of the irrigation system.
  3. Locate all dripline flush valves and dripline indicators on colored plans if the locations differ from design plans.
- C. Controller Cloud Based Communication and Flow Sensor installation confirmation:
  1. Provide written confirmation that the cloud-based communications are set up and operational between controller(s) and cloud-based server.
  2. If controller is a two-wire type controller. Provide confirmation that the controller is communicating with each decoder valve on system and there are no error messages logged on the cloud-based communication system. Provide a printout of information to Landscape Architect or Irrigation Consultant.
  3. Provide written confirmation from the distributor/manufacturer's representative that the controller is communicating with flow sensors and that the correct "k" and "offsets" are setup and utilized properly. The "k" and "offsets" are pre-set numbers you plug into the controller software based on the flow sensor size and type when calibrating the flow sensor. Confirm that flow values have been "learned" and recorded for each valve on the controller, and the correct gpm per valve is shown and verified on a printout and provided to Landscape Architect or Irrigation Consultant. Flow alarms and automatic shut offs should be set up after plant establishment.
- D. Maintenance and Operating Instructions and Manuals:
  1. Contractor shall prepare an Operation and Maintenance Manual, organized in a 3-ring binder, containing the following information.
    - a. Contractor's name, address, and telephone number. Duration of guarantee, periods as specified herein, list of equipment with names and addresses of local manufacturer's representatives with duration of written warranties. Complete operating and maintenance instructions on all equipment spare parts lists and related manufacturer's information.
  2. Submit the Operation and Maintenance Manual to the Project Representative within 10 Calendar Days of completion of work of this Section and as a condition of project acceptance.
- E. Irrigation Audit, Irrigation Survey, and Irrigation Water Use Analysis:
  1. All landscape irrigation audits shall be conducted by a local agency landscape irrigation auditor or a third party certified landscape irrigation auditor. Landscape audits shall not be conducted by the person who design the landscape or installed landscape.

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2. In large projects or projects with multiple landscape installations (i.e. production home developments) an audit rate of 1 to 7 lots or approximately 15% will satisfy this requirement.
3. For new construction and rehabilitated landscape projects installed after December 1, 2015, as described in Section 490.1:
  - a. The project applicant shall submit an irrigation audit report with the Certificate of Completion to the local agency that may include, but is not limited to: inspection, system tune-up, system test with distribution uniformity, reporting overspray or run off that causes overland flow, and preparation of an irrigation schedule, including configuring irrigation controllers with application rate, soil types, plant factor, slope, exposure and any other factors necessary for accurate programming.

#### 1.05 QUALITY ASSURANCE & GENERAL REQUIREMENTS

- A. Qualifications: The Contractor, personally or through an authorized and competent representative, shall supervise the work constantly, and shall as far as possible keep the same foreman and workmen on the job from commencement to completion. The workmanship of the entire job must in every way be first class, and only experienced and competent workmen will be allowed on the job. A minimum of five years' experience of installing irrigation systems of similar scope, size and complexity as the system being installed under this scope of work is required for all on-site job superintendents.
- B. Manufacturer's installation instructions and best practices: Manufacturer's installation instructions shall be followed in all cases when not shown in the Drawings or Specifications.
- C. O.S.H.A. Compliance: All articles and services covered by this specification shall meet or exceed the safety standards established under the Federal Occupational Safety and Health Act of 1970, together with all amendments in effect as of the date of this specification.
- D. All irrigation systems shall be installed to meet or exceed the requirements set forth in the California Department of Water Resources Model Water Efficient Landscape Ordinance.
- E. Codes and Standards: Comply with all applicable codes and standards.
  1. All work and materials shall be in full accordance with the latest rules and regulations of the National Electric Code; published by the Western Plumbing Officials Association; California Code of Regulations, Title 23, Division 2. Department of Water Resources, Chapter 2.7. Model Water Efficient Landscape Ordinance; and other State or local laws regulations. Nothing in these drawings or specifications is to be construed as to permit work not conforming to these codes.
  2. When the specifications call for materials or construction of a better quality or larger size than required by the above mentioned rules and regulations, the provision of the specifications shall take precedence over the requirements of said rules and regulations.
  3. Contractor shall furnish, without extra charge, any additional material and labor when required by the compliance with these rules and regulations, though the work be not mentioned in these particular specifications or shown on the drawings.
  4. The Contractor shall erect and maintain barricades, guards, warning signs, and lights as necessary or required by O.S.H.A. regulations for the protection of the public or workmen.
  5. Any existing buildings, equipment, piping, pipe covering sewers, etc., damaged by the Contractor during the course of his work shall be replaced or repaired by the Contractor in a manner satisfactory to the Project Representative and at Contractor's own expense, before final payment is made. The Contractor shall be responsible for damage caused by leaks in the piping systems being installed or having been installed under this contract. He/she shall repair, at his/her own expense, all damage so caused, in a manner satisfactory to the Project Representative.

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6. The Contractor shall pay for all permits, licenses, and fees required.

#### 1.06 EXISTING CONDITIONS

- A. Protection of Existing Structures and Utilities
  - 1. The Drawings show, if applicable, existing above and below grade structures and utilities that are known to the Project Representative. Locate known existing installations before proceeding with construction operations that may cause damage to such installations. Existing installations shall be kept in service where possible and damage to them shall be repaired with no adjustment of Contract Sum. Verify with Project Representative if As Built drawings are available.
  - 2. If other structures or utilities are encountered, request Project Representative to provide direction on how to proceed with the Work. If a structure or utility is damaged, take appropriate action to ensure the safety of persons and property.
- B. Trench Interference with Existing Tree Root Systems: Prior to trenching, layout main and lateral line locations within drip Line of trees and review locations with Project Representative. Relocate any lines that may interfere with existing root systems to avoid or reduce damage to root systems as accepted by Project Representative.
- C. Provide barricades, coverings, warning signs, lights and other protection required by local code or OSHA to prevent damage to existing improvements to remain and to protect the public.

#### 1.07 LAYOUT OF WORK

- A. The Contractor shall stake out the irrigation system as shown on the drawings. These areas shall be checked by the Contractor and Project Representative before construction is started. Any changes, deletions or additions shall be determined at this check.
- B. Due to the scale of the Drawings, it is not possible to indicate all piping offsets, fittings, sleeves, etc., which may be required. Carefully investigate the conditions affected all of the work and plan accordingly, and furnish all required fittings. Install system in such a manner to avoid conflicts with planting, utilities and architectural features.
- C. Do not install the irrigation system as shown on the Drawings when it is obvious in the field that obstructions, grade differences or discrepancies in arc dimensions exist that might not have been considered. Bring such obstruction or differences to the attention of the Project Representative. Notify and coordinate irrigation Work with applicable contractors for location and installation of piping and sleeves through or under walls, pavement and structures. In the event this notification is not given, the Contractor shall assume full responsibility for any revision necessary.

#### 1.08 SEQUENCING AND SCHEDULING

- A. Acceptance: Do not install main line trenching prior to acceptance by Project Representative of rough grades completed under another Section.
- B. Coordination: Coordinate with the all other trades the sleeving, power requirements of the project, prior to the start of construction.

#### 1.09 INSTRUCTION

- A. After the system has been installed and approved, the Contractor shall instruct the Project Representative and or Maintenance Contractor, in complete operation and maintenance of the irrigation system.

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## **PART 2 - MATERIALS**

### **2.01 PIPE AND FITTINGS**

- A. Main lines (constant pressure); 3" and larger shall be polyvinylchloride (PVC) 1120-Class 200, ASTM D1785, Type 1, Grade 1 with rubber gasketed bell connections with ductile iron fittings with thrust blocks or joint restraints; 2.5" and smaller shall be PVC 1120-Schedule 40 plastic pipe. Pipe shall be made from NSF approved Type 1, Grade 1 PVC compound conforming to ASTM D1785. With-in structure; type 'K' copper pipe.
  - 1. Join lengths of pipe by means of integrally formed bell end on pipe using rubber ring seal.
  - 2. Ring-tite main line: At changes in direction or branch mains, use appropriate Ductile Iron rubber ring seal fittings.
  - 3. Solvent weld main lines: At changes in direction or branch mains, use appropriate Schedule 40 PVC solvent weld fittings as approved by the Uniform Plumbing Code.
  - 4. Copper main lines: Use appropriate wrought fittings at changes of direction or branch mains as approved by the Uniform Plumbing Code.
- B. Lateral lines (non-pressure): 3/4" and larger shall be 1120-Schedule 40 PVC plastic pipe. All lateral lines shall be connected with Schedule 40, Type I, Grade I, PVC solvent weld fittings.
- C. Connections between main lines and RCV's shall be of Schedule 80 PVC (threaded both ends) nipples and fittings.
- D. Risers shall be as follows:
  - 1. Schedule 80 PVC threaded nipples and Schedule 80 PVC ells as shown in the construction details. Offset risers shall be Cobra connector Model CC-600 (1/2"x6").

### **2.02 DUCTILE IRON FITTINGS**

- A. Fittings shall be deep bell push-on joint fittings manufactured for ASTM A536, Grade 65-45-12 ductile iron with a tensile strength of 65,000 psi.
- B. Fittings shall be designed for use on IPS PVC pipe.

### **2.03 Ductile Iron Fitting Encasement:**

- A. Encase all ductile iron fittings and gate valves with a 4-Mil high density, cross laminated (HDCL) polyethylene plastic sheeting (AWWA C105). Wrap and fold around fittings to prevent contact with soil.

### **2.04 GATE VALVES**

- A. Gate valves 2.5" and smaller shall meet the following requirements:
  - 1. Valves shall be of stainless steel (304 or higher) construction with non-rising stem, cross handle and threaded connections.
  - 2. Valves shall be Leemco Model #LGT-SS or approved equal. Size as shown on the drawings
  - 3. Install in 10" diameter plastic valve box as detailed.
- B. Gate valves 3" and larger shall meet the following requirements:
  - 1. Valves shall be cast iron with operating nut (2" square) and "O" ring connections for Class 200 PVC plastic pipe.
  - 2. Install in 10" diameter plastic valve box as detailed.



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## 2.05 QUICK COUPLING VALVES

- A. Quick coupling valves shall be as shown on the drawings. Install in 10" diameter plastic valve box as detailed.

## 2.06 CONTROLLERS

- A. Controller's size and model shall be as listed on the drawings.
- B. Final location(s) of controller shall be approved by the Project Representative.
- C. Controller requires 120v power. Maximum power output of controller is 2.5 amps.
- D. Install Controller and accessories as detailed and per Manufacturer's details.

## 2.07 CONTROL WIRE

- A. Control wire shall be copper with U.L. approval for direct burial in ground, size #14-Common ground wire shall have white insulating jacket; control wire shall have insulating jacket of color other than white or yellow. Runs over 2,000 lineal feet shall be #12- AWG-UF 600 volt copper wire. Splices shall be made with 3M-DBY seal packs.
- B. Provide a separate ground wire for each controller.
- C. Provide a minimum of two spare control wires into each RCV box for future. Spare wires shall be yellow in color.

## 2.08 ELECTRIC REMOTE-CONTROL VALVES

- A. Electric remote control valves sizes shall be shown on drawings.
- B. Electric remote control valve shall be a normally closed 24 VAC solenoid actuated globe pattern valve.
- C. Valves shall be made of durable glass-filled nylon with a pressure rating of 200 PSI
- D. Valve shall have external and internal bleed for manual operation.
- E. Provide and install one Schedule 80 PVC FIPT threaded true union ball valve with EPDM O-rings on the upstream side of valve and one Schedule 80 union on the downstream side of valve. Ball valve shall be Spears True Union model 2300. Match valve size when sizing ball valve and union.
- F. All electric remote control valves for dripline or drip systems shall include a wye filter with a 200 mesh stainless steel screen and pressure regulator on the valve or downstream of the valve.

## 2.09 IDENTIFICATION TAG

- A. Identification tags for all electric control valves shall be manufactured by Christy. Tag numbers shall match stationing in controller and as shown on as-built drawings. Provide one yellow station number tag for each electric control valve as follows:
  1. Potable water systems: Christy ID.STD.Y1

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## 2.010 VALVES BOXES

### A. ELECTRIC REMOTE CONTROL VALVE BOXES:

1. All electric remote control valve boxes that service non-drip systems shall be installed within a NDS Pro Series Model 214BC, 213BCBLK (14"x19") or 221BCB, 222BCB BLK (13" x 24") plastic valve box with bolt down plastic lid or approved equal. Size of box is dependent on the size of valve. Lid shall be marked: "Irrigation Control Valve."
2. All electric remote control valve boxes that service dripline or drip systems shall be installed within a NDS Pro Series Model 221 BCB (13" x 24") plastic valve box with bolt down plastic lid or approved equal. Lid shall be marked: "Irrigation Control Valve."
3. Use black colored boxes in shrub and groundcover areas and green in turf areas.
4. Heat brand controller letter and numbers into lid. Minimum text height to be 2".

### B. GATE VALVE AND QUICK COUPLING VALVE BOXES:

1. All gate valve and quick coupling valve shall be installed within a NDS Pro Series Model 212BCB or 211BBCBLK plastic valve box with plastic lid or approved equal. Use 8" sleeve to encase gate valve.
2. Use black colored boxes in shrub and groundcover areas and green in turf areas.
3. Heat brand the letters "GV" into lid. Minimum text height to be 2".

### C. DRIP COMPONENT BOXES:

1. All drip components shall be installed within a 6" round black plastic valve box with plastic lid. NDS Standard Series Model 107BC plastic valve box with plastic lid or approved

## 2.011 SPRINKLER HEADS AND BUBBLERS

- A. All sprinkler heads shall be as listed on the drawings.
- B. Pop-up spray sprinklers shall include a built in check valve in the body to hold up to 14 feet of head.
- C. Pop-up spray sprinklers shall include built in pressure regulation in the body.
- D. Use 30 psi regulators for all spray nozzles and 45 psi regulators for all rotating nozzles. Use 12" pop-ups in shrub and ground cover areas and 6" pop-ups in turf areas.
- E. Riser units and nipples shall be the same size as the inlet to the sprinkler body.

## 2.012 DRIPLINE & DRIPLINE COMPONENTS

- A. Dripline shall be as listed on the drawings.
- B. Tubing shall be low density, UV resistant, polyethylene tubing with internal pressure-compensating, drip emitters impregnated into the tubing spaced at 12 or 18 inches
- C. The built in emitters shall be capable of delivering 0.6 gallons per hour per emitter.
- D. All dripline systems shall have a manual flush valve at each isolated zone within the systems. Multiple flush valves may be required per drip zone.
- E. All dripline systems shall have air relief valve(s) at the highest elevation point(s) within each isolated zone. Install one air relief valve for every 500 linear feet of dripline.

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## **2.013 MISCELLANEOUS INSTALLATION MATERIALS**

- A. Solvent cement and primer for solvent weld joints shall be of make and type approved by manufacturer(s) of pipe and fittings. Cement shall be maintained at proper consistency throughout use.
- B. Lubricant for assembling rubber ring seal joints shall be of make and type approved by manufacturer of pipe.
- C. Pipe joint compound shall be non-hardening, non-toxic materials designed specifically for use on threaded connections in water carrying pipe. Performance shall be same as RectorSeal #5.

## **2.014 MISCELLANEOUS EQUIPMENT**

- A. Provide all equipment called for by the drawings.
- B. Provide to the Project Representative at completion of the maintenance period, three (3) each of all operating and servicing keys and wrenches required for complete maintenance and operation of all heads and valve. Include all wrenches necessary for complete disassembly of all heads and valves.

## **PART 3 - INSTALLATION**

### **3.01 PREPARATION**

- A. Schedule and coordinate placement of materials and equipment in a manner to effect the earliest completion of work in conformance with construction and progress schedule.

### **3.02 HANDLING AND STORAGE**

- A. Protect work and materials from damage during construction and storage as directed by the Project Representative.
- B. Handle plastic pipe carefully; especially protect it from prolonged exposure to sunlight. Any section of pipe that has been damaged will be discarded and removed and replaced if installed.

### **3.03 LAYOUT**

- A. Lay out work as accurately as possible in accordance with diagrammatic drawings.
- B. Where site conditions do not permit location of piping, valves and heads where shown, notify Project Representative immediately and determine relocation in joint conference.
- C. Prior to installation, the Contractor shall stake out the routing of all pressurized main lines and sprinkler heads for approval by Project Representative.
- D. Run pipelines and automatic control wiring in common trenches wherever practical.

### **3.04 EXCAVATING AND TRENCHING**

- A. Excavation shall be in all cases ample in size to permit the pipes to be laid at the elevations intended and to permit ample space for joining.
- B. Make trenches for pipelines deep enough to provide minimum cover from finish grade as follows:

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1. 18" minimum cover over main lines to control valves and quick coupling valves.
  2. 18" minimum cover over control wires from controller to valves.
  3. 12" minimum cover over RCV controlled lateral lines to sprinkler heads.
- C. Restore surfaces, existing underground installations, etc., damaged or cut as a result of excavations, to original conditions in a manner approved by the Project Representative.
- D. Where other utilities interfere with irrigation trenching and pipe work, adjust the trench depth as instructed by the Project Representative.

### 3.05 ASSEMBLING PIPELINES

- A. All pipe shall be assembled free from dirt and pipe scale. Field cut ends shall be reamed only to full pipe diameter with rough edges and burrs removed.
- B. Install plastic pipe in accordance with manufacturer's recommendations.
- C. Install 3" wide detectable warning tape above all pressurized main lines as shown in the details. Use Christy model #TA-DT-3-BIRR for potable irrigation systems.
- D. Rubber Ring Seal Joint:
1. Use factory made male end or prepare field-cut male end to exact specifications of factory made end.
  2. Carefully clean bell or coupling and insert rubber ring without lubricant. Position ring carefully according to manufacturer's instructions.
  3. Lubricate male end according to manufacturer's instruction and insert male end to specified depth. Use hands only when inserting PVC pipe.
  4. Thrust blocks shall be provided where necessary to resist system pressure on ring-tite pipe and fittings. Blocks shall be concrete and the size shall be based on an average soil safe bearing load of 700# per square foot.
  5. Form thrust blocks in such a manner that concrete comes in contact only with the fittings. Thrust blocks shall be between solid soil and the fittings.
  6. Ductile Iron Fittings Encasement: Wrap valves, tees, elbows, etc. with a flat sheet or split length of polyethylene tube by passing the sheet under and then over the appurtenance and bringing it together around the body of the appurtenance. Make seams by bringing the edges of the polyethylene together, folding over twice and taping them down. Carefully pour thrust blocks so as not to damage polyethylene material.
- E. Solvent Weld Joint:
1. Prepare joint by first making sure the pipe end is square. Then, de-burring the pipe end, and clean pipe and fitting of dirt, dust and moisture.
  2. Dry insert pipe into fitting to check for proper sizing. Pipe should enter fitting 1/3 to 2/3 depth of socket.
  3. Coat the inside socket surface of the fitting and the male end of the pipe with P-70 primer (manufactured by Weld-On). Then without delay, apply Weld-On 711 cement liberally to the male end of the pipe and also apply 711 cement lightly to the inside of the socket. At this time, apply a second coat of cement to the pipe end.
  4. Insert pipe immediately into fitting and turn 1/4 turn to distribute cement and remove air bubbles. The pipe must seat to the bottom of the socket and fitting. Check alignment of the fitting. Pipe and fitting shall be aligned properly without strain to either.
  5. Hold joint still for approximately thirty (30) seconds and then wipe the excess cement from the pipe and fitting.
  6. Cure joint a minimum of thirty (30) minutes before handling, at least six (6) hours before allowing water in the pipe.
- F. Threaded Joint:

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1. Field threading of plastic pipe or fittings is not permitted. Only factory formed threads will be permitted.
  2. Factory made nipples shall be used wherever possible. Field cut threads in metallic pipe will be permitted only where absolutely necessary. When field threading, cut threads accurately on axis with sharp dies.
  3. All threaded joints shall be made up with pipe joint compound. Apply compound to male threads only.
  4. Where assembling metallic pipe to metallic fitting or valve, not more than three (3) full threads shall show when joint is made up.
  5. Where assembling to threaded plastic fitting, take up joint no more than one full turn beyond hand tight.
  6. Where assembling plastic pipe, use strap type friction wrench only; do not use metal-jawed wrench.
- G. Cap or plug openings as pipeline is assembled to prevent entrance of dirt or obstructions. Remove caps or plugs only when necessary to continue assembly.
- H. Where pipes or control wires pass through sleeves, provide removable non-decaying plug at ends of sleeve to prevent entrance of earth.

### 3.06 REMOTE CONTROL VALVES

- A. Install where shown on drawings and group together where practical. Limit one remote control valve per box. No exceptions!
- B. Locate valve boxes 12" from and perpendicular to walk edges, buildings and walls. Provide 12" between valve boxes where valves are grouped together.
- C. Thoroughly flush main line before installing valves.
- D. Install in shrub or groundcover areas where possible.
- E. Label control line wire at each valve with an I.D. tag, indicating identification number of valve (controller and station number). Attach label to control wire.
- F. Flow control stems shall be adjusted or tuned per manufacturer recommendations.

### 3.07 AUTOMATIC CONTROL WIRE

- A. Run lines along mains wherever practical. Tie wires in bundles with pipe wrapping tape at 10' intervals and allow slack for contraction between strappings.
- B. Loop a minimum of three (3) feet of extra wire in each valve box; both control wire and ground wire.
- C. Connections shall be made by crimping bare wires with brass connectors and sealing with watertight resin sealer packs.
- D. Splicing will be permitted only on runs exceeding 2500'. Locate all splices at valve locations within valve boxes.
- E. Where control lines pass under paving, they shall pass through Schedule 40 electrical PVC conduit. Do not tape wire in bundles inside conduit.

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### 3.08 AUTOMATIC CONTROLLER

- A. Provide and install automatic irrigation controller in approximate locations shown on drawings. The exact location will be determined on the site by the Project Representative. Provide conduit and wire and connect to 120 volt switch accessible to controller for ease of maintenance.
- B. Connect control lines to controller in sequential arrangement according to assigned identification number on valve. Each control line wire shall be labeled at controller with a permanent non-fading label indicating station number of valve controlled. Attach label to control wire.
- C. Provide each irrigation controller with its own independent low voltage common ground wire.
- D. Provide each pedestal controller with its own ground rod. Separate the ground rods by a minimum of eight feet. The ground rod shall be an eight foot long by 5/8" diameter U.L. approved copper clad rod or as recommended by controller manufacturer. Install no more than 6" of the ground rod above finish grade. Connect #8 gauge wire with a U.L. approved ground rod clamp to rod and back to ground screw at base of controller with appropriate connector. Make this wire as short as possible, avoiding any kinks or bending. Install a minimum of 8' away from pedestal housing base unless otherwise noted.

### 3.09 BUBBLERS, SPRINKLER HEADS AND QUICK COUPLING VALVES

- A. Thoroughly flush lines before installing heads, bubblers or QCV's.
- B. Locate bubblers, heads and QCV's as shown in the drawings and details.
- C. Adjust sprinkler heads for proper distribution and trim.
- D. Install lawn heads 1" above grade in seeded lawn area at time of installation. Lower to finished grade after turf is well established and as directed by Project Representative.

### 3.010 DRIPLINE AND DRIPLINE COMPONENTS

- A. Thoroughly all flush lines driplines.
- B. Install dripline a minimum of 12" away from all buildings and 6" off hardscapes for shrubs and groundcover. 2" of paving for all no-mow or sod type grasses.
- C. Space driplines equally throughout the planting area as detailed. Refer to legend for emitter and row spacing of dripline. Adjust alternate rows so emitters are spaced in a triangular pattern.
- D. All dripline tubing shall be buried 4" below finish grade and stapled down every 4' and at each change in direction with a 6" tubing stake.
- E. For slopes greater than 10:1, modify dripline row spacing on the bottom 1/3 of the slope to be 25% greater at the bottom of the slope.
- F. Install flush valves at the low end of each drip zone minimum of 2 valves are required for each valve. Refer to manufacturer details for installation instructions.
- G. Install air vacuum relief valve(s) at high point(s) of each planting area. Refer to drawings for approximate locations. Revise locations in field based on actual grades of the site. Locate 1 valve per every 500' of dripline. Refer to manufacturer details for installation instructions.

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- H. Thoroughly saturate soil prior to planting. Provide additional surface watering as required to keep plant root systems moist during planting establishment period.

### 3.011 BACKFILLING

- A. Backfill only after piping and wire has been inspected and approved.
- B. Backfill material shall be the earth excavated from the trenches, free from rocks, concrete chunks, and other foreign or coarse materials.
- C. Place backfill materials in 6" layers and compact by jetting or tamping to a minimum compaction of 90 percent of original soil density.
- D. Dress off areas to finish grade and remove excess soil, rocks, or debris remaining after backfill is completed.
- E. If settlement occurs along trenches, and adjustments in pipes, valves, and sprinkler heads, soil, sod, or paving are necessary to bring the system, soil, sod, or paving to the proper level or the permanent grade, the Contractor, as part of the work under this contract, shall make all adjustments without extra cost to the Project Representative.

### 3.012 FIELD QUALITY CONTROL

- A. Coverage Tests:
  - 1. Perform coverage tests in the presence of Project Representative, after sprinkler or drip system is completed. Test system to assure that all areas are irrigated completely and uniformly.
  - 2. Do not spray onto pavement or structures. Adjust arc nozzles as needed to provide full coverage without over spray.
- B. Adjusting and Cleaning:
  - 1. System adjustment:
    - a. Valves: Adjust flow for proper operation.
    - b. Heads: Adjust for alignment and coverage.
    - c. If it is determined that coverage could be improved by adding additional driplines or a nozzle change, make such changes as required to provide adequate coverage to all plant material.
    - d. Perform final cleaning of all risers, dripline, heads, and equipment for proper operation. Demonstrate operation and uniform coverage in the presence of the Project Representative prior before final acceptance.

### 3.013 TESTING

Perform test as specified below. Remake any faulty joints with all new materials. Use of cement or caulking to seal leaks is absolutely prohibited.

Contractor shall:

- A. Notify the Project Representative at least three (3) days in advance of testing.
- B. Perform testing at his/hers own expense.
- C. Center load piping with small amount of backfill to prevent arching or slipping under pressure. No fitting shall be covered
- D. Apply the following tests after welded plastic pipe joints have cured at least twenty-four (24) hours.

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1. Ring-Tite Mainline: Remove all the air from the piping system then test live (constant pressure) and QCV lines hydrostatically at 125 PSI minimum. Lines will be approved if test pressure is maintained for two (2) hours. Maintain pressure during this time period and measure the amount of water required to maintain that test pressure. Approved tables of allowable loss are below, and the line will be approved or not approved as such results may indicate. The Contractor shall make tests and repairs as necessary until test conditions are met.

Allowable leakage for PVC plastic pipe with elastomeric joints in U.S. gallons per hour at a test pressure of 150 PSI.

- a. 4" - 0.30 gallons per 1000 ft. or 50 joints
  - b. 6" - 0.45 gallons per 1000 ft. or 50 joints
  - c. 8" - 0.60 gallons per 1000 ft. or 50 joints
2. Solvent Weld Mainline: Remove all the air from the piping system then test live (constant pressure) and QCV lines hydrostatically at 125 PSI minimum. Lines will be approved if test pressure is maintained for six (6) hours. The lines shall be restored to the original test pressure. The Contractor shall make tests and repairs as necessary until test conditions are met.
  3. Test RCV controlled lateral lines with water at line pressure and visually inspect for leaks. Retest after correcting defects.

### 3.014 **GUARANTEE**

- A. It shall be the responsibility of the Contractor to fill and repair all depressions and replace all necessary lawn and planting due to the settlement of irrigation trenches for one year following completion and acceptance of the job.
- B. The Contractor shall also guarantee all materials, equipment and workmanship furnished by him to be free of all defects of workmanship and materials, and shall agree to replace at his expense, at any time within one year after installation is accepted, any and all defective parts that may be found.

### 3.015 **MAINTENANCE**

- A. Continuously maintain irrigation system in areas indicated in the Contract during the progress of work and for a period of 90 days after substantial completion.
- B. It is Contractor's responsibility to turn over the irrigation in a first-class condition at the end of the maintenance period.
- C. Maintenance Schedule: Contractor shall submit schedule of maintenance tasks to be performed for Project Representative review and approval. At a minimum, maintenance staff shall be on-site two times per month. It is not the intention of these Specifications to allow a "quick cleanup" at the end of the maintenance period, but rather that the work be continuous and ongoing.
- D. Proper irrigation system maintenance includes the overall supervision of the system, controller scheduling, routine adjustments and necessary repairs.
- E. Maintain irrigation system for optimum performance, as per manufacturer's specifications, by inspecting the entire system on an on-going basis. This includes cleaning and adjusting all bubbler heads, dripline and valves for proper coverage



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### 3.016 **CLEAN-UP**

- A. When work of this section has been completed and at such other times as may be directed, remove all trash, debris, surplus materials, and equipment from site.

### 3.017 **WINTERIZATION OF IRRIGATION SYSTEM**

- A. The Contractor shall be responsible for draining irrigation system in preparation for the first winter after construction has been completed. Instruct Owner's representatives in proper procedures.
- B. Winterization shall proceed as follows:
  1. Close gate valve in irrigation main line located at the water meter.
  2. Insert quick coupling quill, connected to air compressor, into quick coupling valve located at water meter.
  3. Following start of air compressor, program irrigation controller through three (3) complete cycles or until all water has been forced out of the system.
  4. Insert quick coupling quill into QCV at dead end runs of main line to force out all remaining trapped water.
  5. Remove compressor, leaving gate valve to irrigation system closed.

**END OF SECTION 32 80 00**

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## SECTION 329119 LANDSCAPE GRADING

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES:

- A. Weeding.
- B. Finish grading for planting areas.

#### 1.02 RELATED REQUIREMENTS

- A. Division 31 Section Site Clearing
- B. Division 31 Section Earthwork
- C. Division 32 Section Decomposed Granite Surfacing
- D. Division 32 Section: Landscape Work

#### 1.03 DEFINITIONS

- A. Finish Grading: finish grading shall consist of adjusting and finishing soil surfaces with site or imported topsoil, raking grades to a smooth, even, uniform plane. Remove and legally dispose of all extraneous matter off site. Facilitate natural run-off water and establish grades and drainage indicated as part of the contract work.
- B. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 3/4-inches (19 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- C. Finish Grading: Finish grading shall consist of finishing surfaces by raking smoothly and evenly to facilitate natural run-off water, and by removing and disposing of extraneous matter.
- D. Sub-grade: The surfaces upon which additional specified materials are to be placed, prepared, or constructed.
- E. Rough Grade: The establishment of grades to required tolerances.
- F. Finish Grade: Spot elevations (grades) are indicated based on the best available data. Contract Civil Drawings are referenced to provide additional site grading information. It is intended that constant slopes are maintained between spot elevations.
- G. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

#### 1.04 MATERIAL OWNERSHIP

- A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

#### 1.05 EXISTING UTILITIES

- A. Stake and mark the location of existing utilities before commencing work.
- B. Retain and protect in operating condition all active utilities traversing the site designated to remain.

#### 1.06 QUALITY ASSURANCE

- A. Finish grade shall conform to contours, grades, lines, and shapes, as indicated on Contract Drawings, with uniform slopes between finish grades or between finish grades and existing grades.

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- B. Establish finish landscape grades in a continuous, uniform line, resulting in a uniform surface with no ridges or water pockets.
- C. Finish landscape grade tolerance shall be 0.04-feet plus-or-minus from finish elevations indicated on site drawings.

## **PART 2 - PRODUCTS**

### **2.01 SOIL MATERIALS:**

- A. Topsoil: A natural, fertile, friable soil, free from stones, roots, clods larger than 1" in diameter, noxious seeds, weeds, subsoil, undesirable insects, plant disease or any other natural objects detrimental to normal plant growth.
  - 1. Silt plus clay content of the import soil shall not exceed 20% by weight with a minimum 95% passing 2.0-millimeter sieve.
  - 2. Total pore space content on a volume/volume basis shall be at least 15 percent at field capacity.
  - 3. Permeability rate shall be not less than one inch per hour or more than 20 inches per hour.
  - 4. The sodium absorption ratio (SAR) shall not exceed 6 and the electrical conductivity (ECE) shall not exceed 2.0 milliohms per centimeter at 25 degrees centigrade.
  - 5. Soluble boron shall be no greater than 1.0 part per million (mg/l).
  - 6. Soil pH range shall be 6.0 - 7.9.
  - 7. Maximum concentration of soluble chloride shall be 150 parts per million.
  - 8. Maximum concentration of heavy metals shall not exceed the following when the pH is between 6 and 7:
    - a. Arsenic: 1 ppm
    - b. Cadmium: 1 ppm
    - c. Chromium: 5 ppm
    - d. Cobalt: 1 ppm
    - e. Lead: 15 ppm
    - f. Mercury: 0.5 ppm
    - g. Nickel: 2.5 ppm
    - h. Selenium: 1.5 ppm
    - i. Silver: 0.25 ppm
    - j. Vanadium: 1.5 ppm
  - 9. Petroleum hydrocarbons shall not exceed 100 mg/kg dry soil.
  - 10. Aromatic volatile organic hydrocarbons shall not exceed 2 mg/kg dry soil.
- B. Obtain imported topsoil from approved local sources.
- C. All topsoil to be used for planting, regardless of whether import or on-site in origin, shall be tested as described in Part 3 of Section 02900.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION:**

- A. Verification of conditions: Prior to commencing the finish grading, review the installed work of other trades and verify that their work is complete.

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1. Rough Grading: Grading in planting areas (except raised planter areas) shall be established to within plus or minus 0.10 foot prior to beginning of finish grading.
- B. Import topsoil only when necessary to supplement site soil to achieve grades shown on Drawings, or if site soil is unsuitable for planting.

### 3.02 PREPARATION:

- A. Weeding: Before finish grading, weeds and grasses shall be dug out by the root or sprayed with an herbicide and disposed of off-site. This procedure is outlined in Section 02900-Landscape Work.
- B. Remove debris, roots, branches, weeds, stones, in excess of 1/2-inch (13 mm) in size and clumps of earth that do not break up. Before and during finish grading, remove weeds and grasses, including roots, and dispose off-site.
- C. Remove soil contaminated with petroleum products and legally dispose off-site.

### 3.03 INSTALLATION:

- A. General: When rough grading and weeding have been completed, and the soil has dried sufficiently to be readily worked, lawn and planting areas shall be graded to the elevations indicated on the Drawings.
  1. Grades indicated on Drawing are grades that will result after thorough settlement and compaction of the soil.
  2. Grades not otherwise indicated shall be uniform finish grades and, if required, shall be made at the direction of the Architect.
  3. Finish grades shall be smooth, even, and a uniform plane with no abrupt change of surfaces.
  4. Soil areas adjacent to buildings shall slope away from the building to allow a natural run-off of water, and surface drainage shall be directed as indicated on the drawings by remodeling surfaces to facilitate the runoff water at 2% minimum grade.
  5. Low spots and pockets shall be graded to drain properly.
- B. Drainage: Finish grade with proper slope to drains.
  1. Flow lines, designated or not, shall be graded and maintained to allow free flow of surface water.
  2. If any drainage problems arise during construction period due to Contractor's work (such as, but not limited to, low spots, slides, gullies and general erosion), the Contractor shall be responsible for repairing these areas to a condition equal to their original condition, and in so doing shall prevent further drainage problems from occurring.
- C. Prior to placing backfill, remove rock, aggregate base, concrete, and deleterious materials to a depth of 18 inches below soil grade in planter areas. Cross-rip subsoil of friable soil to a depth of 12-inches.
  1. Place a minimum of [15-inches] of topsoil backfill in planters.
  2. Refer to Section 02900 "Landscaping" for soil materials.
- D. Toe of slope: To prevent soil creep or erosion across pavement, where pavement (walk, curb, etc.) is at the toe of a slope, finish grade is to level out or swale slightly at least 12-inches before reaching pavement.
- E. Moisture Content: The soil shall not be worked when the moisture content is so great that excessive compaction occurs, nor when it is so dry that dust may form in the air or that clods do not break readily. Water may be applied, if necessary, to provide moisture content

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for tilling and planting operations. It is the Contractor's responsibility to control dust that is spread as a result of grading operations.

- F. Grades: The finish grade in areas to be planted with turf shall be 1-inch below grade of adjacent pavement, walks, curbs, or headers. Finish grade in shrub areas shall be 1 1/2-inches below adjacent surfaces. Exceptions may be made when drainage conditions require flush grades, as directed by the Architect.
- G. Compaction: Soils in planted areas shall be loose and friable, yet firm enough that no settling occurs from normal foot traffic or irrigation.

#### 3.04 **FIELD OBSERVATION:**

- A. It is the Contractor's responsibility to contact the Architect 48 hours or two working days in advance of each agreed observation or conference.
- B. Schedule for On-Site Reviews: at completion of finish grading and prior to any planting operations.
  - 1. See "Site Observation" in Part 3 of Section 02900-Landscape Work to coordinate inspections and review of work.

**END OF SECTION**

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## SECTION 329223 SODDING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Preparation of subsoil.
- B. Placing topsoil.
- C. Fertilizing.
- D. Sod installation.
- E. Maintenance.

#### 1.02 RELATED REQUIREMENTS

- A. Section 312200 - Grading: Topsoil material.
- B. Section 312200 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

#### 1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 012200 - Unit Prices, for additional unit price requirements.
- B. Sodded Areas:
  - 1. Basis of Measurement: By the square yard (meter).
  - 2. Basis of Payment: Includes preparation of subsoil, placing topsoil, sodding, watering and maintenance to specified time limit.

#### 1.04 DEFINITIONS

- A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

#### 1.05 REFERENCE STANDARDS

- A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding 2006.

#### 1.06 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Certification: Submit certification of grass species and location of sod source.
- C. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer ; and Dormancy period.
- D. Maintenance Contract.

#### 1.07 QUALITY ASSURANCE

- A. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience, and certified by the State of CA.
- B. Installer Qualifications: Company approved by the sod producer.

#### 1.08 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of fertilizer and herbicide mixture.

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### 1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sod on pallets. Protect exposed roots from dehydration.
- B. Do not deliver more sod than can be laid within 24 hours.

### 1.10 MAINTENANCE

- A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Sod: TPI (SPEC), Certified Turfgrass Sod quality; cultivated grass sod; type indicated in plant schedule on Drawings; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft (100 sq m). Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.
  - 1. Bandera Grass Type: 100 percent.
  - 2. Thickness: "Thin" sod, minimum 1/2 inch (13 mm) and maximum 1 inch (25 mm) topsoil base.
  - 3. Cut sod in area not exceeding 1 sq yd (1 sq m).
- B. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay, or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.
- C. Fertilizer: Compost; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated by analysis.
- D. Fertilizer: NPK; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, to the following proportions:
  - 1. Nitrogen: 22 percent.
  - 2. Phosphoric Acid: 4 percent.
  - 3. Soluble Potash: 6 percent.
- E. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

### 2.02 SOURCE QUALITY CONTROL

- A. Provide analysis of topsoil fill under provisions of Section 014000.
- B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, Sulfur, soluble salt content, organic matter content, and pH value.
- C. Submit minimum 10 oz (280 g) sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.
- D. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this section.

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### 3.02 PREPARATION

- A. Prepare subgrade in accordance with Section 312200.
- B. Place topsoil in accordance with Section 312200.

### 3.03 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to installation of sod.
- C. Apply fertilizer no more than 48 hours before laying sod.
- D. Mix thoroughly into upper 2 inches (50 mm) of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

### 3.04 LAYING SOD

- A. Moisten prepared surface immediately prior to laying sod.
- B. Lay sod immediately after delivery to site to prevent deterioration.
- C. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches (300 mm) minimum. Do not stretch or overlap sod pieces.
- D. Where new sod adjoins existing grass areas, align top surfaces.
- E. Where sod is placed adjacent to hard surfaces, such as curbs, pavements, etc., place top elevation of sod 1/2 inch (13 mm) below top of hard surface.
- F. Water sodded areas immediately after installation. Saturate sod to 4 inches (100 mm) of soil.
- G. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roll sodded areas with roller not exceeding [ lbs.300] (Roll sodded areas with roller not exceeding [ ] kg.)

### 3.05 MAINTENANCE

- A. Provide maintenance at no extra cost to Owner; Owner will pay for water.
- B. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches (65 mm). Do not cut more than 1/3 of grass blade at any one mowing.
- C. Neatly trim edges and hand clip where necessary.
- D. Immediately remove clippings after mowing and trimming.
- E. Water to prevent grass and soil from drying out.
- F. Roll surface to remove irregularities.
- G. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- H. Immediately replace sod to areas that show deterioration or bare spots.
- I. Protect sodded areas with warning signs during maintenance period.

**END OF SECTION**



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## SECTION 329300 LANDSCAPE WORK

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Soil Prep and Fertilization.
- B. Planting Operation.
- C. Planting Materials.
- D. Topsoil and Planter Mix.
- E. Agronomic Testing.
- F. Drainage Materials.
- G. Mulching.
- H. Pruning
- I. Tree stabilization.
- J. Edgings.
- K. Tree grates.
- L. Root Barriers.

#### 1.02 RELATED REQUIREMENTS

- A. Division 12 Section Site Furnishings.
- B. Division 31 Section Site Clearing
- C. Division 32 Section Finish Grading
- D. Division 32 Section Landscape Irrigation
- E. Division 32 Section Landscape Maintenance
- F. Division 33 Section Storm Drainage Utilities

#### 1.03 REFERENCE STANDARDS

- A. American Association of Nurserymen, Inc. (AAN)
  - 1. American Standard for Nursery Stock, latest edition (ANSI).

#### 1.04 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.
- D. Bare-Root Stock: Exterior plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of exterior plant required.
- E. Bio-filtration Planting Soil: Imported specialty Soil manufactured offsite by Gail Materials required for storm water infiltration.

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- F. Root Zone: Imported specialty soil manufactured offsite by Gail Materials to be placed beneath turf fields.
- G. Clump: Where three or more young trees were planted in a group and have grown together as a single tree having three or more main stems or trunks.
- H. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of exterior plant required.
- I. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.
- J. Finish Grade: Elevation of finished surface of planting soil.
- K. Sub-grade Elevations: Excavation, filling and grading required to establish elevations is shown on drawings. Coordinate all work with grading contractor in order to arrive at rough grades that will allow tolerance for topsoil in planting areas, soil amendments and ornamental mulch as required in other sections of this specification. Contractor to assume tolerance of rough grades established at  $\pm 0.09$  feet (less than 1 tenths of a foot)
- L. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- M. Multi-Stem: Where three or more main stems arise from the ground from a single root crown or at a point right above the root crown.
- N. Planting Soil: Native or imported topsoil; mixed with soil amendments.
- O. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
- P. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- Q. Pruning: As designated on contract drawings. Items not specifically indicated or specified, but normally required to conform with such work, are considered part of the work.

#### 1.05 SUBMITTALS

- A. WITHIN 30 DAYS OF START OF THE ROUGH GRADING OPERATIONS:
  - 1. Submit a certificate indicating all plant material has been secured for the project and is available.
  - 2. Submit documentation that all plant material has been ordered in accordance with Article 1.6 of this section.
- B. CERTIFICATION: Submit the following:
  - 1. Certificates of inspection as required by governmental authorities when transporting materials into the state.
  - 2. Bulk Materials: Submit a certificate of delivery for all material in containers or bulk.
- C. TEST REPORTS: Submit the following:
  - 1. Agronomic Soils Laboratory Test Report(s) including required amendments and maintenance recommendations.
- D. PRODUCT DATA: Submit the following:

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1. In accordance with Division 1 Section "Submittal Procedures", submit complete manufacturer descriptive literature and specifications for proprietary materials and any additional items required by the Architect. Prior to start of construction and submittals; furnish to the Architect the list of items to be submitted and reviewed.
  - a. Soil Amendments (as identified in Agronomic Soils Report).
  - b. Fertilizer (as identified in Agronomic Soils Report).
  - c. Plant Tablets.
  - d. Stakes and Guys.
  - e. Tree Ties and Vine Ties.
  - f. Seed Mixtures.
  - g. Hydroseed Materials.
  - h. Mulch.
  - i. Hydroseeding: Furnish certificate, in writing, stating that the hydroseeding has been installed as specified.
  - j. Edging Material.
  - k. Filter Fabric.
  - l. Drainage Materials.
  - m. Accessory Material.
  - n. Other soil additives per Agronomic Soils Report.
  - o. Rock mulch.
  - p. Submit other data substantiating that materials comply with specified requirements. Such certificates may be tags, labels, and/or manufacturers literature. All submittals shall be reviewed and accepted by the Architect before contractor begins work.
  - q. Substitution Request
    - 1) If any plant specified is not obtainable, submit a written substitution request to the Architect during the bidding period.
    - 2) Substitutions of plant material will not be permitted unless accepted in advance in accordance with the provisions of Division 1 Section "Product Requirements."
    - 3) The Contractor is responsible for contract growing all required plant material for to project to ensure availability in the size and requirements of the project.
    - 4) All substitution requests for any material must be made during the bid process. No substitution requests will be permitted after the bid process or during.
  - r. With submittal of Bid Documents, submit complete list of plant materials to be provided, including unit prices for plants and for installation. Include:
    - 1) Quantity.
    - 2) Size.
    - 3) Botanical Name.
    - 4) Plant Unit Price.
    - 5) Installation Unit Price.

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2. **PLANTING SCHEDULE:** Submit proposed planting schedule at least two months prior to planting any materials, indicating dates for each type of landscape work coinciding with normal seasons for such work. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. If dates need to be revised after acceptance of planting schedule, document reasons for delays and submit for acceptance.
3. Submit two photos of each tree shrub and groundcover with a person in the image to be used on the project to the architect for review. Photos are to be of the actual material tagged, secured and to be used for the project at the sourced nursery. No plants may be delivered or planted prior to approval by Architect.

## 1.06 QUALITY ASSURANCE

### A. QUALIFICATIONS

1. **Nursery Qualifications:** Regularly engaged, for the preceding ten years, in the production of planting materials equivalent in species and size to those required.
  - a. Stocked, and having a demonstrated ability to provide plant materials required within the constraints of the accepted construction schedule.
  - b. **Landscaper's Qualifications:** Regularly engaged and specializing, for the preceding ten years, in the installation and maintenance of planting materials equivalent in species and size to those required.
    - 1) Capable of furnishing a verifiable list of not less than five projects of equivalent type successfully completed within the preceding two years.
    - 2) **Subcontracts:** Landscape work to a single firm specializing in landscape installation.
2. **Pre-Installation Conference:** Schedule in advance of beginning work of this section. Arrange for attendance by Owner, Architect, and landscaping subcontractor. Review intent of Contract Documents and resolve conflicts. Prepare minutes of conference and distribute to attendees within five (5) days.
3. **Source Quality Control**
  - a. **General:** Comply with regulations applicable to shipping of landscape materials.
  - b. **Analysis and Standards:** All materials shall be of standard, approved and first-grade quality and shall be in prime condition when installed and accepted. Any commercially processed or packaged material shall be delivered to the site in the original unopened container bearing the manufacture's guaranteed analysis. The Contractor shall supply the Architect with a sample of all materials accompanied by analytical data from an approved laboratory source illustrating compliance of bearing the manufactures guaranteed analysis.
4. **Soil-Testing Laboratory Qualifications:** An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
5. **Topsoil Analysis:** Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
  - a. Report suitability of topsoil for plant growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

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6. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 3/4-inches (19 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
  - a. Obtain topsoil only from naturally, well drained sites where topsoil occurs in a depth of not less than 4"; do not obtain from bogs or marshes. All topsoil is to be tested and analyzed by an independent laboratory before delivery to site, as indicated in Article 3.3.
7. Contractor shall provide the Architect with location of soil, crops previously planted on such soil within the last two years, and the USGS soil survey classification and name.
8. Trees, Shrubs and Plants: Provide trees, shrubs and plants of quantity, size, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1-1980 "American Standard for Nursery Stock". Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practice and free from disease, insects, insect eggs, larvae and defects such as knots, sun-scald, injuries, abrasions, overlapping surface roots, or disfigurement. Central leaders of all trees shall be intact, undamaged, with evenly spaced lateral branches.
  - a. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150 mm) above the ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.
9. Label all trees and shrubs with securely attached waterproof tag bearing legible designation of botanical and common name. Where formal arrangements and consecutive order of trees is shown, select stock for uniform height/spread, and label with number to assure symmetry in planting.
10. Stock Review: The Architect will review trees and shrubs at site before planting with requirements for genus, species, variety, size and quality. The Architect retains right to further review trees and shrubs for size and condition of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of the work. Remove rejected vegetation immediately from project site. Contractor shall request review of such stock by the Architect by delivering notice, in writing, 72 hours in advance.
11. Tree Sourcing: All trees are to be secured and purchased through Paul Brunning & Associates, 714-846-2718. Contractor will be responsible for contacting, securing and obtaining materials as identified on the plans. Deposits may be required to secure and maintain plant material.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver exterior plants freshly dug.
- B. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.
- C. Packaged Materials: Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.
  1. Protect plants from sun or drying winds. Protect and maintain plants that cannot be planted immediately upon delivery.

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2. Do not drop plant material.
3. Do not pick up container planter material by stems or trunks.
4. Protect from wind.
5. Water as required.
6. Do not prune trees and shrubs before delivery except as approved by Architect. Do not bend or bind trees or shrubs in such manner as to damage bark, break branches or destroy natural shape. Provide protective covering during delivery, and provide protection on site from traffic, pedestrians, and deleterious effects of climate while planting operations are in progress. Dropped or damaged stock will not be accepted.
7. Deliver trees and shrubs after preparations for planting have been completed and plant immediately after approval of plant materials locations. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture. Do not remove container grown stock from containers until planting time.
  - a. Do not pick up plants by stems or truck. Handle planting stock by root ball.
  - b. Do not remove container - Grown stock from containers before time of planting.
  - c. Water root systems of exterior plants stored onsite with a fine-mist spray.
  - d. Water as often as necessary to maintain root systems in a moist condition.
8. Plant material shall not be stored on the jobsite for more than 48 hours before planting. Contractor shall schedule nursery deliveries in sub-groups as necessary to comply with this requirement.
9. Deliver accessory materials in manufacturer's original, unopened packaging with identifying labels affixed and legible in accordance with state law. Deliver plants with identifying tags affixed. Contractor shall notify Architect 48 hours in advance of plant material delivery for observation. Review plants with Landscape Architect to confirm that they are the plants which had previously been tagged and supplied. The Architect reserves the right to reject the following:
  - a. Plant materials not identifiable as previously selected.
  - b. Materials not accompanied by required certificates.
  - c. Plant materials where damage to rootball, trunks, or desiccation of leaves has been caused by inadequate protection during delivery.
  - d. Plant material not matching the form, shape, or growth habit required for the design intent of the Project.
  - e. Horticultural or visual defects in material.
  - f. Plant material pruned prior to delivery.
  - g. Plant material with detrimental pests.

#### 1.08 PROJECT CONDITIONS

- A. Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.
  1. Planting Restrictions: Coordinate planting periods with maintenance periods to provide required maintenance from date of substantial completion.
    - a. Plant or install materials during normal planting seasons for each type of landscape work required.

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2. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed without having detrimental effects on the plant material, or finished product.
3. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns unless otherwise acceptable to Architect.
  - a. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.
4. Contractor shall verify locations of all existing utilities, whether shown on plans or not. The Contractor shall notify members of Underground Service Alert (U.S.A.) two (2) working days in advance of performing any excavation work by calling the toll-free number 1-800-227-2600
5. After determining location of underground utilities, perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.
6. When conditions detrimental to plant growth are encountered, such as rubble fill, hardpan condition, adverse drainage conditions, or obstructions, notify the Architect before planting. Remove all material deemed unsuitable for plant growth as directed by the Architect.
7. No landscape materials may be planted before an irrigation operation and coverage test is completed by the Architect.
8. No landscape materials may be planted before finish grade is reviewed by the Architect.
9. Existing Trees:
  - a. Prior to the beginning of any clearing, grubbing, trenching, or excavation on site, the general contractor, grading contractor, project arborist, landscape contractor, and the Architect shall meet in a pre-construction conference to discuss grading near existing trees.
  - b. The contractor shall protect all existing trees and shrubs scheduled to remain against injury or damage, including cutting, breaking or skinning of roots, trunks or branches. No blasting of rock shall occur in any area adjacent to existing trees without prior written consent of the Architect.
  - c. No trees or shrubs are to be removed, trimmed, or cut without prior approval of the Architect.
  - d. Prior to the beginning of the clearing and grading phase of the project, a continuous, temporary, six foot (6') high chain link fence shall be erected around the drip line of all trees scheduled to remain, unless otherwise specified by the Architect. The temporary fencing shall be erected prior to commencing any other work on the project. No construction activity shall be allowed within the limits of this fencing unless directed by the Architect. The temporary fencing shall remain in place during the entire construction period and shall not be removed until directed by the Architect.
  - e. Grading beneath trees to be saved shall be given special attention. Every effort shall be made to avoid creating conditions adverse to the tree's health. The natural ground within the drip lines of trees to be preserved shall remain as undisturbed as possible. Grading within the protected root zone of trees to be preserved will not be permitted unless specifically approved by the Architect prior to beginning of proposed grading.

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- f. If during construction or grading (grading, excavation, etc.) tree roots of 2" in diameter or greater are encountered, work shall stop immediately and a Certified Arborist, approved in advance by the Architect, shall be contracted for a root inspection. Root cutting of any roots over 2" in diameter must have prior approval from the Architect. All cuts are to be made with appropriate equipment, as to not affect the plant material.
- g. Major roots one inch (1") or greater in diameter encountered within the drip line of the tree in the course of excavation or trenching shall not be cut and shall be kept moist and covered with earth as soon as possible. Shredding of roots or damaged caused by trenching or grading equipment is not permitted.
- h. Roots one half inch (1/2") to one inch (1") in diameter which are severed shall be trimmed cleanly and covered with earth as soon as possible.
- i. All trenching beneath the drip line of trees to remain shall be done with hand tools only. No mechanical trenching or excavation is allowed within the drip line of existing trees at any time, or where roots are encountered outside the dripline of the tree.
- j. Branches interfering with construction but not designated for removal may be removed only as directed by the Architect.
- k. Any pruning, cutting, or trimming of any trees will be performed by an International Society of Arboriculture Certified Arborist or certified tree worker or in accordance with the National Arborist Association and/or International Society of Arboriculture pruning standards. Cutting of 2" diameter limbs or greater or major dead wooding shall require approval of the Architect.
- l. Trees or shrubs scheduled to remain and damaged by construction operations shall be repaired by the contractor in a manner acceptable to the Architect. Damaged trees and shrubs shall be repaired promptly to prevent progressive deterioration. Repair or replacement of trees and shrubs shall be at the contractor's expense as determined by the Architect. Contractor shall be held fully liable for damage caused to trees and shall be assessed fees based on the International Society of Arboriculture "Guide for Plant Appraisal", as determined by the project Arborist; fees will be assessed for: 1) any injury to the trunk, limbs, or root system, and (2) for the value of any tree requiring removal subsequent to injury or treatment that varies from these Specifications.
- m. A permit from the City Arborist may be required prior to pruning or removing any trees, as required by applicable codes or ordinances.
- n. Parking of vehicles, equipment or storage of materials under the drip line of existing trees shall not occur at any time.
- o. Wash all existing and new trees weekly to remove dust and debris during construction.

#### 1.09 SCHEDULING

- A. Within 30 days after the commencement of initial grading, furnish documentation to the Architect that all plant material has been secured for the project and is available. Contractor shall be responsible for payments and deposits required by the grower or plant consultant to secure, maintain, and grow plant material indicated on the Contract Drawings.

#### 1.10 WARRANTY

- A. Special Warranty: Warrant all plant material in writing where installer agrees to repair or replace plantings and accessories that fail in materials, workmanship or growth within specified warranty period.



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1. Failures include, but not limited to, the following:
  - a. Death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, abuse by owner.
  - b. Structural failures including plantings falling or blowing over including during high wind events.
  - c. Faulty operation of tree stabilization edgings tree grates.
  - d. Deterioration of metals, metal finishes and other materials beyond normal weathering.
  - e. Material not thriving.
  - f. Warranty periods begin from date of final completion:
    - 1) Trees, vines, shrubs: One year.
    - 2) Ground cover and turf: One year.
2. Warrant plant material, installed, or relocated under the contract, in writing, for a period of one year (after beginning of maintenance period) against defects including death, and unsatisfactory growth, except for defects resulting from neglect, abuse or damage by others.
3. Remove and replace trees, shrubs or other plants found to be dead, yellowing, defoliating, or in unhealthy condition, or other defective materials during warranty period at no additional cost to the Owner. Replace trees and shrubs, which in the opinion of the Architect, are in unhealthy condition at end of warranty period. The Architect shall be the sole judge as to the condition of the material. All replacement materials and installation shall comply with the drawings and specifications. Another inspection may be conducted at end of warranty period to determine acceptance or rejection.
4. Upon receipt of written notice from Owner of the loss of any warranted plant materials during the warranty period, the subject plant materials shall be promptly replaced with the same species originally planted, and of a size closely approximating the size of the plant, if normal growth had occurred since the original planting. Replacements shall be subject to the requirements of this specification.
5. When plants are replaced, advise the Owner, in writing, of the new establishment maintenance period equal to the one year.
6. Plant material must be replaced within ten (10) days of written notification, and shall be installed in accordance with these specifications.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Design is based on the use of products manufactured by the following.
  1. Best Fertilizer Company, Lathrop, CA
  2. BFI Organics, Milpitas, CA 408-262-1401
  3. Deep Root Corporation, Burlington, CA 800-458-7668.
  4. Delta Bluegrass Co. Stockton, CA (209) 469-7979
  5. Horizon, Roseville, CA 916-780-2033.
  6. Landscape Forms, represented by Rebecca Casey, 510~594-1777.
  7. LH Voss, Dublin, CA 925-560-9920
  8. Mirafi, Inc. Charlotte, NC. 800-438-1855.

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9. NDS Drainage Products, 800-726-1998.
10. Pacific Coast Seed. 533 Hawthorne Place, Livermore, CA 94551 (925) 373-4417
11. Pacific Sod, Patterson, CA, 800-542-7633.
12. Redi-Grow Corporation, Sacramento, CA, 800-654-4358.
13. S&S Seeds, Camarillo, CA 805-684-0436.
14. Silverado Building Material, Sacramento, CA 916-361-7374.
15. Soil and Plant Laboratory, Inc., Santa Clara, CA 408-727-0330.
16. Stabilizer, Inc. Phoenix, AZ 800-336-2468.
17. Sunland Analytical Labs, Rancho Cordova, CA 916-852-8557.
18. TMT Enterprises, San Jose, CA 408-432-9040.
19. V.I.T. Company, Escondido, CA 760-480-6702.
20. Whitecap, Inc. Rancho Cordova, CA 916-636-3215.
21. Agrono-Tec Seed Co., Wildomar, CA, 800-543-4109.
22. Aguiñaga Fertilizer Co., Inc., Irvine, CA, 949-786-9558.
23. Best Fertilizer Co., Lathrop, CA.
24. Conwed Designscape, Ladyscape, MI, 714-532-5548/800-833-4798.
25. Deep Root Corporation, Burlington, CA, 800-458-7668.
26. Ecology Controls, S&S Seeds, Camarillo, CA, 805-684-0436.
27. Fore Sight Products, Inc., Commerce City, CO, 800-925-5360.
28. Gail Materials, Corona, CA, 951-664-6106.
29. KRC Rock, San Marcos, CA, 800-427-0572.
30. Landscape Forms, represented by Lawrence Casey & Associates, 310-761-0655.
31. Mirafi, Inc., Charlotte, NC 800-438-1855, represented by James Heidt & Associates, Montrose, CA, 818-248-9677/800-233-0512.
32. NDS Drainage Products, 800-726-1998.
33. Quality Turf, Temecula, CA, 800-721-4800.
34. Pacific Sod, Camarillo, CA, 800-762-3027.
35. Permaloc Corporation, Holland, MI, 616-399-9600.
36. S&S Seeds, Camarillo, CA, 805-684-0436.
37. Soil and Plant Laboratory, Inc., Orange, CA, 714-282-8777.
38. Southern California Organic Fertilizer Company, El Monte, CA, 714-750-3830.
39. Southland Sod Farms, Port Hueneme, CA, 805-488-3585.
40. Stabilizer, Inc., Phoenix, AZ, 602-952-8009/800-336-2468.
41. V.I.T. Company, Escondido, CA, 760-480-6702.
42. West Coast Turf, Las Vegas, NV, 800-649-8873.
43. Whitecap, Inc., Santa Ana, CA, 714-258-3300.
44. Whittier Fertilizer, Pico Rivera, CA, 310-699-3461.
45. Wayside Lumber, Rancho Cordova, CA, 916-635-9090.
46. Wallace Labs, El Segundo, CA, 310-615-0116.

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47. Whittier Fertilizer, Pico Rivera, CA, 562-699-3461.
48. Materials shall be the products of one manufacturer and shall be either the ones upon which the design is based, or the products of manufacturer accepted in advance. No substitutions will be permitted.

## 2.02 SOIL

- A. TOPSOIL: Site to be rough graded to elevations shown on Civil Drawings. Topsoil will be required behind curb areas and in planting area. Provide on-site, import, or non-processed topsoil in planting areas as needed to complete rough grading which is fertile, friable, and natural loam in accordance with Article 2.3. Topsoil shall be from agricultural sources, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 3/4-inch in any dimension, and other extraneous or toxic matter harmful to plant growth.
- B. All topsoil to be used for planting, regardless of whether import or on-site in origin, shall be tested as described in Part 3 of this Section.

## 2.03 SOIL AMENDMENTS

- A. On Grade:
  1. The initial application of fertilizers and amendments to be tilled into the soil during soil preparation operations shall be established after soil testing has been conducted by Contractor. An estimated quantity is indicated below for bid purposes only. This estimated quantity does not include mulching, fertilizer tablets, additional topsoil necessary to meet specified grades and fertilizer applications for after planting. After soils analysis recommendations are made to the Architect quantifying the actual amount of amendments required and recommendations have been accepted by the Architect, the Contractor shall, without delay, determine any cost impacts whether credit, no change, or addition, to the Contract Amount. As an integral part of the bid for Landscape Work, provide a Lump Sum bid amount for fertilizers and amendments as described below.
  2. Application Rates (FOR BID PURPOSES ONLY):
    - a. Sixty (60) lbs. of Tri-C Humate per 1,000 square feet.
    - b. Nineteen (19) lbs. of 6-20-20 fertilizer per 1,000 square feet.
    - c. Six (6) cubic yards of Aguiñaga GPS2, nitrogen stabilized compost per 1,000 square feet.
    - d. 50-lbs Agricultural Gypsum, per 1,000 square feet.
  3. Actual amendment rates and type shall be per soil test recommendations.
  4. Imported Topsoil
    - a. Provide natural, fertile, friable soil free from stones, noxious weeds, seeds, roots, subsoil or other material detrimental to normal plant growth. Topsoil acidity range (pH) shall be between 6.5 and 7.5 containing a minimum of 4 percent and a maximum of 25 percent organic matter.
    - b. Reuse surface soil stockpiled onsite. Verify suitability of stockpiled surface soil to produce top soil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
      - 1) Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain top soil displaced from naturally well drained sites where topsoil occurs at least 4 inches deep; do not obtain from [agricultural land], bogs or marshes. Obtain soil from local sources acceptable to the Architect.

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- 2) Silt plus clay content of soil shall not exceed 15 percent by weight with a minimum 95 percent passing a 2 millimeter sieve.
- c. Obtain imported topsoil from local sources acceptable to the Architect.
- d. Silt plus clay content of soil shall not exceed 15 percent by weight with a minimum 95 percent passing a 2-millimeter sieve.
5. Soil Amendments:
  - a. "Nitrified Redwood Compost": 0.56 to 0.84% N based on dry weight, treated with relative form of nitrogen (NH<sub>3</sub>).
    - 1) Particle Size
    - 2) 95% - 100% passing 6.35 mm standard sieve.
    - 3) 80% - 100% passing 2.33mm standard sieve.
    - 4) Salinity: The saturation extract conductivity shall not exceed 3.5 millimhos/centimeter at 25 degrees (25N) centigrade as determined by saturation extract method.
    - 5) Iron Content: Minimum 0.08% dilute acid soluble Fe on dry weight basis.
    - 6) Ash: 0 - 6.0% (dry weight)
    - 7) Acidity range (ph) shall be between 5.5 and 7.5.
    - 8) Actual organic content shall be a minimum 280 pounds (lbs.) per cubic yard.
    - 9) As available from: Redi-Grow Corporation, 909 Elder Creek Road, Sacramento, CA 95828
  - b. Organic soil amendment shall be Aguinaga GPS2.
    - 1) Particle Size:
      - (a) 90-100 percent passing 6.35 mm standard sieve.
      - (b) 80-100 percent passing 4.75 mm standard sieve.
    - 2) Salinity: The saturation extract conductivity shall not exceed 6.5 milliohms/centimeter at 25 degrees Centigrade as determined by saturation extract method.
    - 3) Iron Content: Minimum 0.08 percent dilute acid soluble iron on dry weight basis.
    - 4) Actual organic content shall be a minimum of 280 pounds (lbs.) per cubic yard.
6. Fertilizers
  - a. Tri-C Humate. Provide per manufacturers specification.
  - b. Fertilizer Tablets: Fertilizer Tablets: The following is to be used in the planting of container grown material. Follow manufacturer's application rates.
    - 1) Best-Paks "20-10-5" fertilizer packets. Packets to be made up of a minimum of 20% Nitrogen, 10% Phosphorus, 5% Potash. Use 1 Pak per 1-gallon container, (G.C.), 3 Paks per 5 G.C., 9 Paks per 15 G.C. and 12 Paks per boxed specimen. Evenly distribute as shown in details.
  - c. Commercial Fertilizer: First Quality Commercial Fertilizer, as specified in Agronomic Soils Report.
  - d. Related Materials:
    - 1) Pre-Planting Herbicide: Round-up, or equal.

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- 2) Pre-Emergent Weed Control: Ronstar-G, Treflan, Eptam, Vegitex, or equal.
- 3) Organic Soil Amendment: Aguinaga G-PS2.
- 4) Peat Moss: Sphagnum peat moss, Canadian or European variety, free from alkali.
- 5) Soil Sulfur: First quality commercial grade.
- 6) Ferrous Iron Sulfate: Chelated first quality commercial grade.
- 7) Agricultural Gypsum: First quality commercial grade.
- 8) Best "Ammonium Phosphate" 16-20-0 with net less than 16% total nitrogen, 20% available phosphoric acid and 0% soluble potash.
- 9) Good Humus.
- 10) Root Hormone: Super Thrive.
- 11) Compost: Aguinaga G-PS2.

#### 2.04 PLANT MATERIALS

- A. Furnish trees from Paul Brunning and Associates that have been pre-selected and pre-tagged by Landscape Architect.
- B. Quality: Provide trees, shrubs, and other plants of size, form, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock".
- C. Deciduous Trees: Provide trees of height and caliper scheduled or shown and with branching configuration recommended by ANSI Z60.1 for type and species required. Provide single stem trees except where special forms are shown or listed.
  1. Lateral scaffolds shall be radially distributed around the trunk. The lateral branch shall be no more than 2/3 the diameter of the trunk. Trunk to be measured 1" above the branch (lateral scaffold).
  2. The minimum acceptable length of the most recent season's shoot growth for slow growing trees shall be not less than 8"; for fast growing trees not less than 12".
  3. The minimum acceptable height of trees is 6'-0" when planted, or as determined by Architect.
  4. Needle Leafed and Broad Leafed Evergreen Trees: Provide evergreens of sizes shown or listed. Where dimensions are shown, they indicate minimum spread for spreading and semi-spreading type evergreens and height for other types, such as globe, dwarf, cone, pyramidal, broad upright, and columnar. Provide normal quality evergreens with well-balanced form complying with requirements for other size relationships to the primary dimension shown.
    - a. The minimum acceptable height of trees is 6'-0" when planted, or as determined by Architect.
  5. Multi-Trunk Trees: Provide sizes shown or listed. Tree is to have a minimum of three (3) dominant trunks with appropriate caliper size and adequate spread.
  6. Shrubs: Provide shrubs of the size shown and with not less than the minimum number of canes required by ANSI Z60.1 for type of shrub required. Provide container grown stock.
  7. Ground Cover: Provide plants established and well-rooted in removable containers, in flats, or integral peat pots and with not less than minimum number and length of runners required by ANSI Z60.1 for the size shown or listed.

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8. Vines: Provide vines with good, well-established root systems within the container, and devoid of any abrasions, and or damage to stem.

## 2.05 MISCELLANEOUS LANDSCAPE MATERIALS:

- A. Tree Stakes: Provide stakes of sound new lodgepole pine 2" minimum diameter with minimum height, as indicated on Contract Drawings. Stakes shall have been treated with copper naphthanate or ACQ (alkaline) or Ca-B (copper azole) to a minimum wood depth of 1/16". All stakes shall be free of knots larger then 1/2" in diameter, holes and other defects.
- B. Tree Straps: Provide VIT "Cinch-tie" black tree straps. Tree straps shall be attached to tree stake as shown in staking detail on the plans, color to be black.
  1. Provide for 24-inch box size and smaller tree.
  2. 36-inch box size and larger tree; provide VIT "Cinch-Belt" tree straps.
- C. Vine Ties: Plastic vine ties, as specified on plans.
- D. Guying Materials
  1. At On-Grade Planting:
    - a. Guy Wire: No. 9 gage, galvanized, twisted clothesline type.
    - b. Anchor System: Duckbill Earth Anchor System, as manufactured by Fore Site Products, Inc.
      - 1) Box trees, sizes 24-inch box to 72-inch box: Model 68 DTS.
      - 2) Box trees, sizes 84-inch and larger: Model 88 DTS.
    - c. Hose: White neoprene hose, 3/4-inch diameter, covering the entire length of wire.
  2. At Raised Planters:
    - a. Guy Wire: No 9 gage, galvanized, twisted clothesline type.
    - b. Anchors for Holding Guys: 1-inch galvanized eyebolt with lead expansion shield.
    - c. Hose: White neoprene hose, 3/4-inch diameter, covering the entire length of wire.
  3. Turnbuckle: 51/16 inches by 6 inches long galvanized steel type.
  4. At Tree Grates
    - a. Guy Wire: No. 9 gage, galvanized, twisted clothesline type.
    - b. Anchor System: Duckbill Earth Anchor System, as manufactured by Fore Site Products, Inc.
      - 1) Box trees, sizes 24-inch box to 72-inch box: Model 68 DTS.
      - 2) Box trees, sizes 84-inch and larger: Model 88 RBK
- E. Headerboards And Edging
  1. Wood Polymer Headerboard:
    - a. All wood used shall be "Trex" or "EPIC Plastics" wood-polymer lumber.
    - b. Headerboards shall be:
    - c. 2" x 6" (for straight runs and smooth curves)
    - d. Splices shall be made with 1" x 6" not less than 12" in length.
    - e. Stakes shall be made with 1" x 3" x 16" or 1" x 2" x 18".
    - f. 1¼", #8 plated deck screws.
    - g. Refer to manufacturer's literature for product handling and installation.
    - h. Backing at splices, 1" x 4".

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2. Concrete edger: Dimension as specified on plans, poured in place concrete edger, color per plan.
  3. Steel Edge Restraint for Decomposed Granite Walk or Landscape Areas: Available Manufacturers and Products: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
    - a. Pave Tech, Inc.
    - b. J.T. Ryerson & Son, Inc. Or equal (no known equal).
      - 1) Material: Steel.
      - 2) Size: 1/4" x 5".
      - 3) Color: Black.
      - 4) Stakes: 4 foot maximum spacing.
      - 5) Wood: Rough construction heart redwood, 12-foot minimum length, free from knots and splits. Provide 2 by 4 for straight sections and three laminations of 1/4-inch material for curved sections.
      - 6) Stakes: 1 by 2 by 18-inch construction heart redwood, bevel cut.
      - 7) Scabs: 1 by 4 by 4-feet long construction heart redwood.
      - 8) Nails: Common, galvanized, 16d.
      - 9) Splices: 1 by 4 by minimum 24-inches long.
  4. Aluminum Edge Restraint for Decomposed Granite Walk or Landscape Areas:
    - a. Cleanline as manufactured by Permaloc Corporation.
      - 1) Color and Finish: Black anodized finish.
      - 2) Stakes: 12 inch long aluminum
- F. Mulch
1. Bark Mulch:
    - a. Mulch shall be "small" fir bark mulch, as manufactured by Whittier Fertilizer.
    - b. Mulch shall consist of "walk-on" fir bark mulch with a particle range of 3/4-inch to 1-inch in diameter. (Shredded bark is not acceptable).
      - 1) Physical properties:
        - (a) Percent Passing Sieve Size
        - (b) 90-100 1 inch (25.4 mm) Dia.
        - (c) 80-100 1/2 inch (12.7 mm) Dia.
        - (d) 20-60 1/4 inch (6.35 mm) Dia.
      - 2) Chemistry
        - (a) Acid in reaction, max pH 5.0.
        - (b) Maximum ash Chemistry: 7% based on dry weight.
        - (c) Minimum moisture 35% at time of delivery based on fresh weight.
      - 3) As available from Redi-Grow Corporation, Sacramento, CA.
- G. Root Control Barriers: High-density polypropylene root control planter. Acceptable products include:
1. Deep Root; Deep Root Corporation.

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2. Size as specified on drawings.
- H. Drainage Materials
1. Gravel in raised planters on structural slab and in pots shall be clean, coarse 3/8-inch to 3/4-inch diameter.
  2. Gravel for tree drainage shall be 3/4" diameter coarse clean gravel.
  3. Synthetic filter membrane cover over drainage course shall be woven synthetic fabrics.
    - a. Model 140N, as manufactured by Mirafi.
  4. Drain Pipe at trees: 4-inch diameter PVC perforated(within gravel), and non-perforated PVC drain pipe(stand pipe) with PVC adaptor connected to 4-inch ABS female reciever with 4-inch black ABS cleanout plug.
- I. Sand: Washed plaster sand.
- J. Jute Netting: A uniform open plan weave, single jute yarn not varying in thickness by more than 1/2 of its normal diameter, in rolled strips approximately 50 to 75 yards long and 50 to 60 inches wide. Contractor shall submit sample for approval prior to installation.
- K. Staples: 11 gage with 1-inch top and 6-inch legs.
- L. Sod Pegs: 1-inch square by 6-inch long pine or 6-inch lengths of lath.
- M. Weed Control: Round-up, Rodeo, or equal.
- N. Landscape Drainage System:
1. Catch Basin: NDS Model #1200 12x12 catch basin; black color with NDS #1217 riser extension as necessary.
  2. Grate: NDS Model #1290 atrium grate in planter area, NDS Model #1211 in turf area; black color.
  3. Outlet adapter: NDS Model#1266 universal outlet; as necessary. NDS Model #1206 universal plug; as necessary.
  4. Pipe: PVC (Polyvinyl Chloride) Sewer Pipe and Fittings: ASTM D 3034, SDR 35, for solvent cement.
  5. Solvent Cement: ASTM D 2564.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected, and Architect has reviewed and accepted materials as defined within the section.

#### **3.02 SITE OBSERVATION SCHEDULE**

- A. General: Notify Architect at least 5 days in advance when requesting on-site reviews.
- B. Prior to commencement of site visits, items noted in previous observation reports shall have been either completed or remedied, unless such compliance has been waived. Failure to complete prior tasks or failure to prepare adequately for scheduled observations shall obligate Contractor to reimburse Architect for additional hourly services, plus transportation costs
- C. Schedule For On-Site Reviews by the Landscape Architect:



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1. Pre-construction conference with general contractor, grading contractor, landscape contractor, project arborist and landscape architect to discuss grading and protective measures to be followed in the vicinity of existing trees, or existing structures.
2. Review of soil sampling and fine grading prior to installation of any planting material.
3. At completion of finish grading, and roto-tilling
4. Review of irrigation coverage prior to installation of any planting material.
5. At completion of fine grading and at delivery of plant materials, together with plant layout; prior to excavating pits.
6. Review of drainage system, standpipes, and plant material locations.
7. After planting pits have been excavated, but prior to backfilling. Provide one sample plant pit mock up for review.
8. After initial planting operations (One tree with each type of specified staking shall be approved prior to planting of trees).
9. Stake all tree locations for review.
10. See "Final Review and Acceptance" at the end of Part 3 in this Section for final site observations and acceptance of work.

### 3.03 TESTING

#### A. Planting Soil: Agronomic Soil Testing

1. Test shall be paid for by the Contractor. Testing lab shall be:
  - a. Wallace Labs, El Segundo, CA
  - b. Soil and Plant Labs, Orange, CA
  - c. Sunland Analytical Labs, Rancho Cordova, CA
  - d. Soil & Plant Lab, Santa Clara, CA
  - e. Agronomic Soils Testing
    - 1) Take six samples of site soil at a depth of 6 to 12 inches, within proposed planting areas, after completion of final grading and prior to weed control and soil preparation.
    - 2) Take samples to agronomic soils testing laboratory indicated above for soil evaluation.
    - 3) Request testing for fertility and suitability analysis with written recommendations for soil amendment, fertilizer and chemical conditioners, application rates for soil preparation, planting backfill mix, pot-soil mix, hydro-spray, and post-maintenance fertilization programs.
    - 4) Soils report recommendations shall take precedence over the amendment and fertilizer application rates specified in this section.
    - 5) Submit testing laboratory's interpretation, recommendations, and comments to Architect within 14 days after the completion of rough grading.
  - f. Furnish a soils analysis of import soil, and organic soil amendment prior to backfill.
    - 1) Submit soil testing laboratory's findings to Architect within 5 days prior to backfilling.
  - g. Take six additional soil samples after completion of planting in the soil preparation and backfill mix areas, to be determine effectiveness to amendments prior and during planting. Submit to the testing laboratory the original amendment

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specification with previously issued bulletins for soil amendments and installation procedures. Re-apply necessary amendments based on recommendation of new soils test.

### 3.04 PREPARATION

#### A. Final Grades

1. Finished grading shall insure proper drainage of the site. Conform to Division 31 Section "Earthwork" and Division 32 Section "Finish Grading."
2. The following areas shall be graded so that the final grades shall be established below adjacent paved areas, sidewalks, valve boxes, headers, clean outs, drains, manholes, etc. before placement of mulch as follows:
  - a. Shrub/Groundcover Areas: 1-1/2 inches.
  - b. Turf areas: 1-inch.
  - c. Surface drainage shall be away from all building foundations, 2% minimum.
  - d. Dispose of excess or unacceptable soil from the site at no expense to the Owner.
  - e. Verify that final grades have been established prior to beginning planting operations.
3. Parking Lot Planters and areas adjacent to hardscape.
  - a. All aggregate base rock, lime-treated soil, soil sterilents, and other non-organic materials shall be removed from all parking lot planter areas down to the level of native soil. Scarify native soil to a depth of 12 inches and backfill planters to specified finish grade with native or approved topsoil and amend as specified.
  - b. Remove all concrete overpours or any material that may prohibit the placement of plant material, irrigation, grates, root barriers, or any other conflicting material.
4. Lightweight soil mix shall be sampled after mixing and delivery to the site, but prior to filling planters. Submit the original lightweight soil specification to the testing laboratory with previous bulletins for lightweight soil mix. Provide 1-quart of lightweight soil mix for every 65 cubic yards for organic and fertility analyses. Fertility analysis, recommendations and interpretations shall be furnished by the testing laboratory to ensure all specified amendments have been provided. Lightweight soil is to be used only in locations indicated on the Contract Drawings and as approved by the Architect.
5. Protect planting areas from compaction by foot, trucks and heavy equipment.

### 3.05 PLANTING BED ESTABLISHMENT

#### A. Preparation Of Planting Area

1. Cross-rip on-grade planting areas to a minimum depth of 12 inches minimum 2 perpendicular directions. Remove stones over ½ inch (13mm) in any dimension and sticks, roots, rubbish and other deleterious matter per Section 02312 "Finish Grading".
2. Where additional soil is needed, place the top 15" with topsoil. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil.
3. Leach soil prior to amending.
4. After approximate finished grades have been established and soil has been leached, soil shall be conditioned and fertilized in the following manner: Soil condition shall, at the rate specified in the approved soils test recommendations, be uniformly spread and cultivated thoroughly by means of mechanical tiller into the top eight inches (6") of soil.

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5. Broadcast soil amendments uniformly over surface of the area to be treated. Roto-till the top eight inches (6") of planting areas to evenly distribute the amendments and conditioners into the soil.
6. Retest as required to verify leaching was successful. All soil areas shall be compacted and settled by application of irrigation to a minimum depth of six (6) inches prior to any plant materials being installed.
7. At time of planting, the top 12 inches of all areas to be planted shall be free of stones, stumps, or other deleterious matter one 1/2 inch in diameter or larger, and shall be free from all debris, or similar objects that would be a hindrance to planting and maintenance.
8. Weed Eradication:
  - a. Manually remove all existing vegetation in planting areas and dispose of it offsite.
  - b. Fertilize planting areas with urea 30-0-0 commercial fertilizer at the rate of 0.5 pounds per 1000 square feet.
  - c. Water planting areas thoroughly and continuously (by irrigation system, hand/hose, water truck, or other) for a period of 3 consecutive weeks, or until the weed seed have germinated. As accepted in advance by the Landscape Architect, employ a specific watering duration and frequency program designed to germinate residual weed seeds.
  - d. Discontinue watering process for 2 days. Then apply a non-selective broad spectrum systemic herbicide for perennial weeds. The type of herbicide to be used shall be determined by a licensed pest control applicator. If annual weeds are present, use straight contact herbicide in accordance with pest control applicator's recommendations.
    - 1) Do not use a pre-emergent herbicide.
  - e. Allow sufficient period of time to ensure that weeds are dead. Follow herbicide manufacturer's directions.
  - f. Water planting areas thoroughly and continuously (by irrigation system, hand/hose, water truck or other) for a period of 3 weeks. A shorter watering period may be permissible at the discretion of the Landscape Architect. Discontinue watering process for 1 day prior to the second application of the herbicide spraying. Re-apply the spraying operation with straight contact weed killer in accordance with pest control adviser's recommendations.
    - 1) Do not use a pre-emergent herbicide.
    - 2) Avoid irrigation for a minimum of 4 days for effective final weed kill.
  - g. Clear desiccated weeds from the area.
  - h. Water Planting areas thoroughly and continuously for 3 consecutive days to saturate upper layers of soil prior to planting operations.
  - i. Allow planting area soil surface to dry out for 1 day only prior to the planting application. Exercise care to not allow the soil surface to be either super-saturated with water or bone dry prior to the planting installation. Ensure moderate residual moisture within the top 1/4 inch of the soil surface.
  - j. The hydraulic equipment used for pesticide applications shall consist of an ISO-gallon minimum capacity fiberglass tank with complete mechanical agitation. The pump capacity shall be 10 gallons per minute while operating at a pressure of 100 pounds. Per square inch.

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- k. Distribution lines shall be large enough to carry the volume of water necessary for even, chemical distribution. The spray nozzle must cover a 15-foot swath, with a minimum output of 5 gallons per minute at 80 pounds per square inch.
9. Pre-emergent Weed Control: Immediately after planting, apply pre-emergent weed control to planted areas which will not be seeded.
10. Excavation For Trees And Shrubs
  - a. Excavate pits, beds, and trenches as shown in details on the drawings.
11. Preparation for Lawn Areas: Limit preparation to areas which will be planted promptly after preparation.
  - a. Prepare planting area as described in 3.05 A.
  - b. Fine grade lawn areas to smooth, even surface with loose, uniformly fine texture. Roll, rake and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Establish smooth uniform surface. Limit fine grading to areas which can be planted immediately after grading.
  - c. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.
12. Restore lawn areas to specified conditions if eroded or otherwise disturbed after fine grading and prior to planting.

### 3.06 PLANTING

#### A. General

1. Actual planting shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted practice, as approved by the Architect.
2. Only as many plants as can be planted and watered on that same day shall be distributed in a planting area.
3. Container shall be opened and plants shall be removed in such a manner that the ball of earth surrounding the roots is not broken and they shall be planted and watered as herein specified immediately after removal from the containers. Containers shall not be opened prior to placing the plants in the planting area.

- B. Layout individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas and secure acceptance by the Architect before start of planting work. Make minor adjustments as may be requested.

#### C. Excavation for Trees and Shrubs:

1. Excavate pits, beds and trenches as shown in details on the Drawings.
2. Roughen and score edges of planting pit to eliminate any glazing of the sides of the pit.
3. Field Samples: Prior to planting, prepare one plant pit with standpipe, gravel, filter fabric, and root barriers for each tree size to be reviewed by the Architect.
4. Do not cover standpipes.
5. Excavation for planting shall include the stripping and stockpiling of all acceptable topsoil encountered within the areas to be excavated for trenches, tree pits, plant pits, and planting beds.

#### D. Container Removal

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1. Cut containers on two sides with an acceptable cutter. Do not cut containers with spade or ax. Do not injure the rootball.
  2. Carefully remove plants from containers without injury or damage to rootball.
  3. After removing plants, superficially cut edge roots with knife on three sides.
  4. For plants with sensitive roots, place container intact in flat pit 1½ times the size of a standard plant pit. Insert blades of sharp, needle-nose shears into a drain hole and cut the container bottom away. Remove bottom from pit. Follow with a cut down one side of the container from top to bottom. Repeat cut on opposite side. Fill plant pit with prepared plant pit mixture. Carefully remove the detached pieces.
- E. Box Removal:
1. Remove bottom of planting boxes before planting.
  2. Remove sides of box without damage to rootball after positioning plant and partially backfilling.
- F. Planting Trees and Shrubs: Set container-grown stock, plumb and in center of pit or trench. Set top of rootball 2-inches above finish grade at trees, 1-inch above finish grade at shrubs, or as indicated on Contract Drawings. Do not use plant, if root system has severely kinked or circling roots, or if rootball is cracked, disturbed or broken. If root system is healthy, loosen spiraling roots and set in plant pit.
- G. Planting pit shall be backfilled with the following soil conditioner and organic amendment, per cubic yard:
1. Application Rates, (below are for bid purposes only) as determined by contractor's soils tests:
    - a. Potassium Sulfate - 0-0-50, ¼-pound
    - b. Single Superphosphate - 0-20-0, ¼-pound
    - c. Ammonium Sulfate - 21-0-0, ¼-pound
    - d. Compost - 15% by volume
    - e. Agricultural Gypsum - 1.5 pounds
    - f. Good Humus - 15% by volume
  2. Final amendments to be determined by Agronomic Soils Test.
- H. When set, place additional fill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 1/2-full, place appropriate number of fertilizer tablets and complete backfill operations.
- I. After backfilling, an earthen basin shall be constructed around each plant. Each basin shall be as indicated on the Contract Drawings. Basin shall be of a size suitable for the individual plant. In no case shall the basin for fifteen (15) gallon plant be less than four (4) feet in diameter; a five (5) gallon plant less than three (3) feet in diameter. The basins shall be constructed of amended backfill materials, and shall not be constructed for trees in turf areas.
- J. Repeat watering until no more is absorbed.
- K. Apply pre-emergent herbicide as per manufacturer's recommendations to all shrub and ground cover planting areas after planting.
- L. Mulch all planted areas that do not receive jute netting, other than lawn areas, at not less than 2" thickness of mulch.
1. Areas greater than 30% slope shall be protected with jute mesh.

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- M. Equally space and align trees and shrubs in both directions where designated on Contract Drawings.
- N. Pull bark mulch away from the rootballs of all plants to insure proper air circulation.
- O. Prune, thin out and shape trees and shrubs in accordance with standard horticultural practices. Prune trees and other plantings only if required. Pruning shall be limited to remove injured wigs and branches, and to compensate for loss of roots during transplanting, but never exceed 1/3 of the branch structure. Never prune without prior review with Architect.
- P. Prune shrubs to retain natural character. Unless directed by the Architect, do not prune leaders or apices of any plant material. Do not prune into balled or boxed forms without prior written approval of the Architect.
- Q. Remove and replace excessively pruned or malformed stock resulting from improper pruning.
- R. Planting Ground Cover
  - 1. Space plants as shown or scheduled.
  - 2. Dig holes large enough to allow for spreading of roots and compact area around plant. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover crowns of plants with wet soils.
  - 3. Mulch areas between ground cover plants with not less than 2" deep mulch.
- S. Miscellaneous Landscape Work: Install headers and edgings where shown. See appropriate details. Install 5" minimum layer of gravel, where shown, as specified in Section 2.04, compacted and leveled to fill voids at areas around building as shown on drawings.
- T. Planting Vines: Plant in accordance with Section 3.06. Attach vine to columns with vine ties as per manufacturer's recommendations.
- U. Tree Staking and Guying: Stake or guy all trees per landscape details, and tie with tree ties as specified. Remove all nursery stakes from trees unless directed otherwise by the Architect. Immediately after planting, stake and guy all trees in accordance with details indicated on Contract Drawings. One tree of each size shall be staked and guyed, and reviewed by Architect prior to continue work.
- V. Hardpan Conditions
  - 1. Where hardpan exists, whether it is in the form of caliche, rock or other impervious matter, and it is within the top 2½ feet of soil, or within the plant pit, use powered equipment to break through completely at each plant location to allow drainage and root growth. Remove hardpan at least 1½ feet greater than the rootball diameter of plant. Backfill with soil mix as specified.
  - 2. Where hardpan is within the first 12-inches of soil, it shall be completely penetrated for all trees and shrubs.

### 3.07 CLEANUP AND PROTECTION:

- A. During landscape work, keep pavements clean and work area in an orderly condition. Haul away and remove all debris from landscape areas, and do not leave any clippings, and or other material from landscape planting and/or maintenance period.
- B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and/or other trades. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.

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- C. Powerwash all pavement and flatwork as necessary to remove all staining and tire marks and provide a clean surface.

### 3.08 FINAL REVIEW & ACCEPTANCE

- A. General: Notify Architect at least 5 days in advance when requesting on-site reviews.
- B. Final Site Observation requirements:
  - 1. Punch list at substantial completion.
  - 2. Final review of grading, irrigation and planting (to begin Maintenance Period).
  - 3. Final acceptance of project (at end of Maintenance Period).
  - 4. Refer to Division 32 Section "Landscape Maintenance."
  - 5. The maintenance period will not begin until all punchlist items are resolved and acceptance is provided by the architect in writing.
  - 6. Where observed work does not comply with the Plans and Specifications, replace rejected work and continue specified maintenance period until reinspected by the Landscape Architect and determined to be acceptable. All replacement materials and installations shall be in accordance with the Plans and Specifications. Remove rejected work and materials immediately from project. Prior to the date of final observation, Contractor shall provide the Landscape Architect with all Record Drawings in accordance with the Plans and Specifications.

### 3.09 GUARANTEE AND REPLACEMENT

- A. Guarantee: All plant material and other materials installed under the Contract shall be guaranteed against any and all poor, inadequate or inferior materials and/or workmanship or improper maintenance, as determined by the Landscape Architect, and shall be replaced by the Contractor at his expense. Warranty periods are as follows:
  - 1. Trees, vines, and shrubs: One Year
  - 2. Groundcover and Turf: One Year
  - 3. Replacement: Any materials found to be dead, missing, or not in a satisfactory or healthy condition during the maintenance period shall be replaced immediately. The Landscape Architect shall be sole judge as to the condition of material. Material to be replaced within the guarantee period shall be replaced by the Contractor within five (5) days of written notification by the Landscape Architect. All replacement materials and installations shall comply with the Plans and Specifications. Any plant missing due to suspected theft shall be replaced by the Contractor. If the Contractor suspects that theft may be a problem, the Contractor shall provide written documentation to the Landscape Architect that security on this site needs to be intensified.
  - 4. The Contractor may relieve himself of theft responsibility if after the security notice, with no result, a written notice to the Landscape Architect shall be given that plant material will not be replaced for theft or vandalism due to lack of site security being maintained. This procedure may take place only during the Landscape Maintenance Period.

**END OF SECTION**

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## SECTION 330110.58 DISINFECTION OF WATER UTILITY PIPING SYSTEMS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Disinfection of site domestic water lines and site fire water lines specified in Section 331416.
- B. Testing and reporting results.

#### 1.02 RELATED REQUIREMENTS

- A. Section 331416 - Site Water Utility Distribution Piping.

#### 1.03 REFERENCE STANDARDS

- A. AWWA B300 - Hypochlorites 2018.
- B. AWWA B301 - Liquid Chlorine 2010.
- C. AWWA B302 - Ammonium Sulfate 2016.
- D. AWWA B303 - Sodium Chlorite 2018.
- E. AWWA C651 - Disinfecting Water Mains 2014.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Test Reports: Indicate results comparative to specified requirements.
- C. Disinfection report:
  - 1. Type and form of disinfectant used.
  - 2. Date and time of disinfectant injection start and time of completion.
  - 3. Test locations.
  - 4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
  - 5. Date and time of flushing start and completion.
  - 6. Disinfectant residual after flushing in ppm for each outlet tested.
- D. Bacteriological report:
  - 1. Date issued, project name, and testing laboratory name, address, and telephone number.
  - 2. Time and date of water sample collection.
  - 3. Name of person collecting samples.
  - 4. Test locations.
  - 5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
  - 6. Coliform bacteria test results for each outlet tested.
  - 7. Certification that water conforms, or fails to conform, to bacterial standards of the local water agency requirements.

#### 1.05 QUALITY ASSURANCE

- A. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of the State of California.

### PART 2 PRODUCTS



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## 2.01 DISINFECTION CHEMICALS

- A. Chemicals: AWWA B300 Hypochlorite, AWWA B301 Liquid Chlorine, AWWA B302 Ammonium Sulfate, AWWA B303 Sodium Chlorite, AWWA B300 Hypochlorite, AWWA B301 Liquid Chlorine, AWWA B302 Ammonium Sulfate, AWWA B303 Sodium Chlorite, AWWA B300 Hypochlorite, AWWA B301 Liquid Chlorine, AWWA B302 Ammonium Sulfate, AWWA B303 Sodium Chlorite, AWWA B300 Hypochlorite, AWWA B301 Liquid Chlorine, AWWA B302 Ammonium Sulfate and AWWA B303 Sodium Chlorite.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that piping system and water well has been cleaned, inspected , and pressure tested.
- B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

### 3.02 DISINFECTION

- A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.
- B. Provide and attach equipment required to perform the work.
- C. Introduce treatment into piping system.
- D. Maintain disinfectant in system for 24 hours.
- E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.
- F. Replace permanent system devices removed for disinfection.

### 3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 014000.
- B. Test samples in accordance with AWWA C651.

**END OF SECTION**

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## SECTION 331416 SITE WATER UTILITY DISTRIBUTION PIPING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Pipe and fittings for site water lines including domestic water lines and fire water lines.
- B. Valves and Fire hydrants.

#### 1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete for thrust restraints.
- B. Section 099113 - Exterior Painting.
- C. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.
- D. Section 312323 - Fill: Bedding and backfilling.
- E. Section 330513 - Manholes and Structures.
- F. Section 330110.58 - Disinfection of Water Utility Piping Systems: Disinfection of site service utility water piping.

#### 1.03 REFERENCES

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.
- C. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2016.
- D. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 2015, with Editorial Revision (2018).
- E. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series) 2015.
- F. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40 2017.
- G. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2015.
- H. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals 1998 (Reapproved 2011).
- I. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding 2011 (Amended 2012).
- J. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems 2010.
- K. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings 2017.
- L. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast 2017, with Errata (2018).
- M. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service 2009.
- N. AWWA C502 - Dry-Barrel Fire Hydrants 2018.
- O. AWWA C504 - Rubber-Seated Butterfly Valves 2015.
- P. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 48-In. (50-mm Through 1,200-mm) NPS 2017.
- Q. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service 2015.
- R. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances 2017.

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- S. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution 2016.
- T. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service 2017.
- U. UL 246 - Hydrants for Fire-Protection Service Current Edition, Including All Revisions.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

#### 1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with utility company requirements.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers with labeling in place.

### PART 2 PRODUCTS

#### 2.01 WATER PIPE

- A. Ductile Iron Pipe: AWWA C151:
  - 1. Fittings: Ductile iron, standard thickness.
  - 2. Joints: AWWA C111/A21.11, rubber gasket with rods.
  - 3. Jackets: AWWA C105/A21.5 polyethylene jacket.
- B. Copper Tubing: ASTM B88, Type K, annealed:
  - 1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
  - 2. Joints: Compression connection or AWS A5.8M/A5.8, BCuP silver braze.
- C. PVC Pipe for Domestic Water Supply, smaller than 4": ASTM D1785, Schedule 80.
  - 1. Fittings: ASTM D2466, PVC.
  - 2. Joints: ASTM D2855, solvent weld.
- D. PVC Pipe for Domestic Water Supply, 4" to 12": AWWA C900 DR18 (Class 150).
  - 1. Fittings: AWWA C153, ductile iron.
  - 2. Joints: ASTM D3139 compression gasket ring.
- E. PVC Pipe for Fire Water Supply, 4" to 12": AWWA C900 DR18 (Class 150) and DR14 (Class 200).
  - 1. Fittings: AWWA C153, ductile iron.
  - 2. Joints: ASTM D3139 compression gasket ring.
- F. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service" in large letters.
- G. Detectable Warning Tape: 4-mil polyethylene tape, 3-inch width minimum, imprinted with "CAUTION WATER LINE BELOW".

#### 2.02 VALVES

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Gate Valves Up To 3 Inches (75 mm):
  - 1. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression ends, with control rod, post indicator, valve key, and extension box.

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C. Gate Valves 3 Inches (75 mm) and Over:

1. AWWA C500, iron body, bronze trim, non-rising stem with square nut, single wedge, flanged ends, control rod, post indicator, valve key, and extension box.

D. Ball Valves Up To 2 Inches (50 mm):

1. Brass body, Teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA inlet end, compression outlet with electrical ground connector, with control rod, valve key, and extension box.

E. Swing Check Valves From 2 Inches to 24 Inches (50 mm to 600 mm):

1. AWWA C508, iron body, bronze trim, 45 degree swing disc, renewable disc and seat, flanged ends.

F. Butterfly Valves From 2 Inches to 24 Inches (50 mm to 600 mm):

1. AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, ten position lever handle.

### 2.03 HYDRANTS

- A. Hydrants: Type as required by utility company.

### 2.04 BEDDING AND COVER MATERIALS

- A. Bedding: As specified in Section 312316.13.  
B. Cover: As specified in Section 312316.13.

### 2.05 ACCESSORIES

- A. Concrete for Thrust Blocks: Portland cement concrete per ASTM C150, Type II/V.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Prior to beginning work, verify that building service connection and municipal and site water main size, location, and invert are as indicated.

### 3.02 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.  
B. Remove scale and dirt on inside and outside before assembly.  
C. Prepare pipe connections to equipment with flanges or unions.

### 3.03 TRENCHING

- A. See the section on trenching for additional requirements.  
B. Hand trim excavation for accurate placement of pipe to elevations indicated.  
C. Form and place concrete for pipe thrust restraints at each change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide thrust restraint bearing on subsoil, size as indicated.  
D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

### 3.04 INSTALLATION - PIPE

- A. Maintain separation of water main from sewer piping in accordance with the California Plumbing code.  
B. Install pipe to indicated elevation to within tolerance of 5/8 inches (20 mm).  
C. Install ductile iron piping and fittings to AWWA C600.

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- D. Route pipe in straight line.
- E. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- F. Install detectable warning tape 6 inches (150 mm) above top of pipe; coordinate with Section 312316.13.

### 3.05 **INSTALLATION - VALVES AND HYDRANTS**

- A. Set valves on solid bearing.
- B. Center and plumb valve box over valve. Set box cover flush with finished grade.
- C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.
- D. Set hydrants to grade, with nozzles at least 20 inches (500 mm) above ground.
- E. Paint hydrants as required by the local fire authority or as indicated.

### 3.06 **SERVICE CONNECTIONS**

- A. Provide water service to utility company requirements with reduced pressure backflow preventer and water meter with bypass valves and sand strainer.

### 3.07 **FIELD QUALITY CONTROL**

- A. Perform field inspection and testing in accordance with Section 014000.
- B. Hydrostatic Pressure Test: Test in accordance with Greenbook, Section 306-8.9.2 or as required by the local water agency.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

**END OF SECTION**

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## SECTION 333113 SITE SANITARY SEWERAGE GRAVITY PIPING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Sanitary sewerage drainage piping, fittings, and accessories.
- B. Connection of building sanitary sewer system to existing on-site system.

#### 1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.
- B. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.
- C. Section 312323 - Fill: Bedding and backfilling.
- D. Section 330513 - Manholes and Structures.

#### 1.03 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

#### 1.04 REFERENCE STANDARDS

- A. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe 2018.
- B. ASTM C12 - Standard Practice for Installing Vitrified Clay Pipe Lines 2016a.
- C. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets 2012 (Reapproved 2017).
- D. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings 2004 (Reapproved 2018).
- E. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 2015, with Editorial Revision (2018).
- F. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications 2014.
- G. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2011.
- H. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings 2017.
- I. Standard Specifications for Public Works Construction (Greenbook), latest edition.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating pipe, pipe accessories .
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

### PART 2 PRODUCTS

#### 2.01 SEWER PIPE MATERIALS

- A. Provide products that comply with applicable code(s).
- B. Ductile Iron Pipe: ASTM A746, Pressure Class 350, with asphaltic lining, inside nominal diameter as indicated, bell and spigot end.
- C. Joint Seals for Ductile Iron Pipe: AWWA C111/A21.11 rubber gaskets.

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- D. Joint Seals for Clay Pipe: ASTM C425 compression gasket joint devices.
- E. Plastic Pipe: ASTM D3034, SDR 35, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter as indicated, bell and spigot style rubber gasket joints.
- F. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

## 2.02 PIPE ACCESSORIES

- A. Detectable warning tape: 4-mil polyethylene tape, 3-inch width minimum, imprinted with "CAUTION SEWER LINE BELOW".

## 2.03 SEWER STRUCTURES

- A. Cleanouts: In accordance with the plans and as specified by the local jurisdictional authority.

## 2.04 BEDDING AND COVER MATERIALS

- A. Pipe Bedding Material: As specified in Section 312316.13.
- B. Pipe Cover Material: As specified in Section 312316.13.

# PART 3 EXECUTION

## 3.01 GENERAL

- A. Perform work in accordance with applicable code(s).

## 3.02 EXAMINATION

- A. Prior to beginning work, verify that building service connections, municipal and site storm main size, location, and invert are as indicated.

## 3.03 TRENCHING

- A. See Section 312316.13 for additional requirements.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.
- C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

## 3.04 INSTALLATION - PIPE

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
  - 1. Plastic Pipe: Also comply with ASTM D2321.
- C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch (3 mm) in 10 feet (3 m).
- D. Connect to building sanitary sewer outlet and municipal sewer system , through installed sleeves.
- E. Install detectable warning tape 6 inches (150 mm) above top of pipe; coordinate with Section 312316.13.

## 3.05 INSTALLATION - CLEANOUTS

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated.

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- D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

### 3.06 **FIELD QUALITY CONTROL**

- A. Perform field inspection and testing in accordance with Section 014000.
- B. Air Pressure Test: Test in accordance with Greenbook, Section 306-7.8.2.4.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

### 3.07 **PROTECTION**

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

**END OF SECTION**



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## SECTION 333213 PACKAGED WASTEWATER PUMPING STATIONS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Pre-engineered, prefabricated assemblies comprising pump(s), valve(s), internal piping, and controls.
- B. Wet well and pump chamber construction.

#### 1.02 RELATED REQUIREMENTS

- A. Section 015000 - Temporary Facilities and Controls: Temporary water and power for field quality control testing.
- B. Section 312316 - Excavation.
- C. Section 312323 - Fill: Backfilling.
- D. Section 333113 - Site Sanitary Sewerage Gravity Piping: Connections to sanitary sewerage. piping system.
- E. Section 333123 - Sanitary Sewerage Force Main Piping. Connections to sanitary sewerage force main piping system.

#### 1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's technical literature for prefabricated assemblies and pump chamber and access way; include installation instructions.
- C. Shop Drawings: Detailed drawings of entire pumping station, combining components furnished by different manufacturers, if any.
- D. Operating and Maintenance Data:
  - 1. Submit preventative maintenance and inspection procedure for package lift stations.
  - 2. Include in procedures the frequency of preventative maintenance, inspection, adjustment, lubrication, and cleaning necessary to minimize corrective maintenance and repair.
  - 3. Submit spare parts data, including a complete list of parts and supplies with current unit prices and source of supply.
- E. Maintenance Materials:
  - 1. One set of special tools that are required for maintenance and testing.
- F. Executed Warranty.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. See Section 016000 - Product Requirements for additional requirements.

#### 1.05 WARRANTY

- A. Warranty: Provide manufacturer's warranty for packaged pump station, with itemized list of components covered by warranty; include list of specific operation and maintenance procedures that are required to keep warranty valid.

### PART 2 PRODUCTS

#### 2.01 PACKAGED WASTEWATER PUMPING STATIONS

- A. Packaged Wastewater Pumping Stations: Pre-engineered duplex sewage pump station, including wet well/pump chamber construction, access way(s), valves, internal piping, internal wiring, controls, and other necessary components for continuous, unattended,

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automatic operation.

1. Furnish all components factory-assembled to greatest extent possible; where field installation is required, provide piping, wiring, and other components as required for a complete installation.
  2. Service Life: 15 years.
  3. Pumping Capacity: 150 gallons per minute, minimum.
  4. Total Head: 21 feet.
  5. Finish all components in accordance with manufacturer's standard practice for sewage resistance.
- B. Pump Lifting Assembly: Factory-assembled, mounted in wet well, designed to allow each pump to be independently raised to ground level for maintenance and returned to position without entering wet well; vertical rails, pump support assembly sliding on rails, integral guide bracket on pump, pump quick disconnect with hydraulic sealing flange, discharge pipe supports, and lifting chain; all metal parts stainless steel or bronze.
- C. Anchors and Fasteners: Stainless steel.
- D. Identification: For each item of equipment, provide the manufacturer's name or trademark and model number on corrosion-resistant identification plate, cast integrally, stamped, or otherwise permanently marked in conspicuous place; for pumps, include pump capacity in gallons per second and liters per minute, pump head in feet and meters, speed of rotation, and direction of rotation.

## 2.02 PUMPS

- A. Sewage Solids-Handling Pumps: Non-clogging submersible centrifugal pump designed to pump unscreened sewage and capable of passing 3 inch (76 mm) solids.
1. Capable of operating in partially submerged condition.

## 2.03 WET WELL AND PUMP CHAMBER CONSTRUCTION

- A. Construction: Concrete construction.

## 2.04 VALVES AND PIPING

- A. Valves: Provide one gate valve and one check valve on each pump discharge line.

## 2.05 CONTROL FUNCTIONS AND INSTRUMENTATION

- A. Automatic Controls: Provide automatic controls for pump and other equipment operation, with local manual controls.
- B. Pump Controls: Provide controls capable of operating pumps either simultaneously or individually, depending on load conditions.
1. Pump Actuator: Submersible pressure type level sensor.
  2. Each time low-water level is reached, set the other pump as Lead.
  3. Operate both pumps if water level rises above high-water level.
  4. Prevent both pumps from starting at the same time.
  5. Stop both pumps when low-water level is reached.
  6. If one pump is disabled, switch operation to other pump.
  7. Include alarm to warn of failure of pumps.
- C. Emergency High Level Alarm: Float-operated water level switch independent of pump control; set at emergency high-water level; activating alarm indicators.

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- D. Electronic Pump Controllers: Mount in starter panel enclosure, visible with enclosure door opened in front of swing-out panel.

## 2.06 POWER

- A. Electrical Power Available: As indicated on drawings.

## 2.07 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Test pump, valve, and piping assembly in factory prior to shipping, at test pressure equal to 50 percent more than pump discharge pressure or total dynamic head, whichever is greater.

# PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify inlet and discharge piping connection match size, location, and elevation shown on Drawings.

## 3.02 INSTALLATION

- A. Install as indicated, in accordance with drawings and manufacturer's instructions.

## 3.03 FIELD QUALITY CONTROL

- A. After installation but before backfilling or connecting to sewer piping, test pump, valve, and piping assemblies under test pressure equal to 50 percent more than pump discharge pressure or total dynamic head, whichever is greater, using clean water. Backfill in accordance with Section 312323.
  - 1. Include alarm conditions to show that alarms are correctly connected and functioning.

### END OF SECTION

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## SECTION 334211 STORMWATER GRAVITY PIPING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Storm drainage piping, fittings, and accessories.
- B. Connection of drainage system to existing on-site system.
- C. Catch basins, Plant area drains and Paved area drainage.

#### 1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.
- B. Section 312316 - Excavation: Excavating of trenches.
- C. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.
- D. Section 312323 - Fill: Bedding and backfilling.

#### 1.03 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

#### 1.04 REFERENCE STANDARDS

- A. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe 2018a.
- B. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets 2012 (Reapproved 2017).
- C. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2014.
- D. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 2015, with Editorial Revision (2018).
- E. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications 2014.
- F. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2011.
- G. Standard Specifications for Public Works Construction (Greenbook), latest edition.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating pipe, pipe accessories.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- D. Project Record Documents:
  - 1. Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.

#### 1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the Work of this section.

### PART 2 PRODUCTS

#### 2.01 PIPE MATERIALS

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- A. Concrete Pipe: Reinforced, ASTM C76, Class II with Wall type A; mesh reinforcement; inside nominal diameter as indicated, bell and spigot end joints
- B. Reinforced Concrete Pipe Joint Device: ASTM C443 (ASTM C443M) rubber compression gasket joint.
- C. Plastic Pipe, Poly Vinyl Chloride (PVC) material, bell and spigot style solvent sealed joint end.,
  - 1. 3" to 15": ASTM D3034, SDR 35

## 2.02 PIPE ACCESSORIES

- A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.
- B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.
- C. Detectable warning tape: 4-mil polyethylene tape, 3-inch width minimum, imprinted with "CAUTION STORM DRAIN LINE BELOW".

## 2.03 STRUCTURES

- A. Storm drainage structures and cleanouts shall be in accordance with the plans and as specified by the local jurisdictional agency.

## 2.04 BEDDING AND COVER MATERIALS

- A. Bedding: As specified in Section 312316.13.
- B. Cover: As specified in Section 312316.13.

# PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Prior to beginning work, verify that building service connection and municipal and site utility water main size, location, and invert are as indicated.

## 3.02 TRENCHING

- A. See Section 312316.13 - Trenching for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

## 3.03 INSTALLATION - PIPE

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch (3 mm) in 10 feet (3 m).
- C. Connect to building storm drainage system, foundation drainage system, and utility/municipal sewer system.

## 3.04 INSTALLATION - STRUCTURES

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast-in-place concrete base pad, with provision for storm drainage pipe end sections.
- C. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.
- D. Establish elevations and pipe inverts for inlets and outlets as indicated.
- E. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

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F. Prefabricated trench drains:

1. Excavate; prepare substrate and supports according to the manufacturer's printed installation instructions.
2. Install prefabricated trench drain system according to the manufacturer's printed installation instructions.
3. Expansion, Construction, and Control Joints: Do not locate trench drain system on an expansion, construction or control joint in concrete or pavement. Where concrete or pavement joints running transverse to direction of flow cross the trench drain system, locate concrete or pavement joints and trench drain system joints so that both coincide.
4. Concrete Trench Support: 3000 pounds per square inch (20.68 MPa) compressive strength, minimum.
  - a. Provide support on all sides of trench in minimum thickness recommended by trench drain system manufacturer.
  - b. Screed and finish top edge of concrete flush with top surface of trench drain system.
  - c. Do not use secondary edge finishing tools.

**3.05 FIELD QUALITY CONTROL**

- A. Perform field inspection and testing in accordance with Section 014000 - Quality Requirements.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

**3.06 PROTECTION**

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

**END OF SECTION**