



Project Manual

For

Polytechnic High School New Softball/Soccer Field Improvements at Satellite Campus

1545 Long Beach Blvd., Long Beach, CA 90813

Bidding and Contract Requirements
And
Specifications

for the

Long Beach Unified School District
2425 Webster Avenue, Long Beach, CA 90810

Date: April 14 2026

PBK Project No.: 240469
DSA Application No.: 03-125644

Construction Documents

Project Manual

for:

Polytechnic High School Improvements

for the

Long Beach Unified School District

Date: November 21 2025

PBK Project No.: 240469

DSA Application No.: 03-125644

Construction Documents

Consultants:

Architect:

PBK
8163 Rochester Avenue
Suite 100
Rancho Cucamonga, CA 91730
Phone: (909) 987-0909

**Structural:**

Kubala Engineers
2400 E Katella Avenue
Suite 950
Anaheim, CA 92806
Phone: (949) 548-5000

**Civil:**

DIG Engineering
2400 E Katella Ave,
Suite 950
Anaheim, CA 92806
Phone: (949) 669-4434

**Electrical:**

LEAF Engineers
8163 Rochester Avenue
Rancho Cucamonga, CA 91730
Phone: (909) 987-0909

**Mechanical:**

LEAF Engineers
8163 Rochester Avenue
Rancho Cucamonga, CA 91730
Phone: (909) 987-0909

**Landscape**

Edgeland Group
12520 High Bluff Drive,
Suite 250
San Diego, CA 92130
Phone: (651) 324-9412



IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 03-125644 INC:
REVIEWED FOR
SS ☒ FLS ☒ ACS ☒
DATE: 04/15/2026

Project Manual Cover Sheet and Seal Page.

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SUMMARY OF WORK

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. 01 33 00 Submittals; and
- 1.1.5. 01 50 00 Temporary Facilities and Controls

1.2. SUMMARY OF WORK

The Work may consist of the following:

- 1.2.1. Demolition of all existing buildings, shade structures and associated site work for the new improvements described below for the **Polytechnic High School Improvements project**. Construction of a new soccer field, softball field, dugouts, batting cages/bullpens, bleachers, perimeter fence, field lighting, scoreboard. Additionally, (2) modular buildings including ticket room, restrooms, custodial, electrical, IDF, and concession room. NOTE: modular buildings are Owner Furnished Owner Installed (Refer to specification section 13 34 23.01 Pre-Engineered Modular Buildings – Responsibility Matrix for additional information).
- 1.2.2. Site Logistics Plan to be submitted by Contractor based upon District's requirements for Phasing. If the Project requires Phasing, Contractor to submit a separate Site Logistics Plan per phase. Site Logistics Plan, including updates throughout the Project, to be submitted to District upon request. Prior to commencement of the Work, and no later than ten (10) calendar days, Contractor shall prepare and submit to the District, a detailed Project Site Logistics Plan. Site Logistics Plan to be in the same size and scale of the Drawings, setting forth Contractor plan of the Work, including but not limited to:
 - 1.2.3.1. In accordance with local ordinances a truck access route to and from the Project site.
 - 1.2.3.2. The identification of any overhead wire restrictions for power, street lighting, signal, and/or cable.
 - 1.2.3.3. Local sidewalk access and street closure requirements.
 - 1.2.3.4. Protection of sidewalk pedestrians and vehicular traffic.

- 1.2.3.5. Project site fencing and access gate locations.
- 1.2.3.6. Construction parking.
- 1.2.3.7. Material staging and/or delivery areas.
- 1.2.3.8. Material storage areas.
- 1.2.3.9. Temporary trailer locations.
- 1.2.3.10. Temporary service location and proposed routing of all temporary utilities.
- 1.2.3.11. Location of temporary and/or accessible fire protection
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- 1.2.3.17. Traffic control signage.
- 1.2.3.18. Perimeter and site lighting.
- 1.2.3.19. Stockpile and/or lay down areas.
- 1.2.3.20. Emergency Vehicle Access Routes.

1.3. CONTRACTS

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

1.4. DEFERRED APPROVAL ITEMS

- 1.4.1. All items that are subject to subsequent review and approval by the Division of the State Architect shall be as indicated below. No deferred approval items shall be installed until the Contractor has complied with all the processes in the Contract Documents, including Division 01 Document "01 33 00 Submittals."
- 1.4.2. Deferred approval items for this Project are the following:
 - 1.4.2.1 **No deferred approvals within the scope of this project.**

1.5. SPECIAL PROJECT REQUIREMENTS

- 1.5.1. Hours of Work: Work is to be performed during regular work hours. It is the contractor's responsibility to verify the working hours allowed with the city where their work is to be performed. Contractor shall coordinate its operations with activities taking place at each campus such as summer school, graduations, and testing. Contractor shall ensure that there are no disruptions to such activities.

1.6. WORK BY OTHERS

- 1.6.1. Work to be performed and completed prior to the start of the Project:
 - 1.6.1.1. **Removal of furniture, equipment, and technology-related equipment as identified on the demolition drawings.**

1.7. CODES, REGULATIONS AND STANDARDS

- 1.7.1. The codes, regulations, and standards adopted by the State and federal agencies having jurisdiction shall govern minimum requirements for the 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. Where codes, regulations, and/or standards conflict, the more stringent shall apply. Notify the District and the Architect of any conflicts before proceeding.
- 1.7.2. Codes, regulations, and standards are as published effective as of date of bid opening, unless otherwise specified or indicated.

1.8. EXAMINATION OF EXISTING CONDITIONS

- 1.8.1. Contractor shall be held to have examined the Project Site and acquainted itself with the conditions of the Site and of the streets and roads approaching the Site.
- 1.8.2. Prior to commencement of Work, Contractor and District shall jointly 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. Contractor shall digitally document existing conditions and provide copy to Owner.
- 1.8.3. 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.

1.9. CONTRACTOR'S USE OF PREMISES

- 1.9.1. Contractor shall take all reasonable precautions for the safety of the students and the school employees throughout the duration of the Project.
- 1.9.2. 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.

- 1.9.3. 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, at no expense to District.
- 1.9.4. Contractor shall not interfere with others use of or access to occupied portions of the building(s) or adjacent property.
- 1.9.5. Contractor shall maintain corridors, stairs, halls, and other exit-ways of building clear and free of debris and obstructions at all times.
- 1.9.6. 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.

1.10. PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- 1.10.1. 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.
- 1.10.2. 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.
- 1.10.3. Contractor shall furnish, install, and maintain adequate supports, shoring, and bracing to preserve structural integrity and prevent collapse of existing improvements and or Work modified and/or altered as part of the Work.
- 1.10.4. Contractor shall cover and protect surfaces of rooms and spaces in existing facilities turned over for the Work, including District property remaining within as required to prevent soiling or damage from dust, dirt, water, and/or fumes. Contractor shall protect areas adjacent to the Work in a similar manner. Prior to District occupancy, Contractor shall clean all surfaces including District property.

1.11. UTILITY SHUTDOWNS AND INTERRUPTIONS

- 1.11.1. Contractor shall give the District a minimum of five (5) business days written notice, on District Utilities Shut Down Request form, in advance of any need to shut off existing utility services or to effect equipment interruptions. 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.
- 1.11.2. 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.

1.12. STRUCTURAL INTEGRITY

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

1.13. ENVIRONMENTAL REQUIREMENTS

- 1.13.1. Comply with all local, state, and federal environmental requirements. To the extent possible, materials, processes, procedures, and equipment included in these specifications shall comply with sustainable practices.

END OF DOCUMENT

DOCUMENT 01 12 10

CONTRACT FORMS AND SUBMITTALS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. 01 33 00 Submittals; and
- 1.1.5. 01 32 16 Construction Schedule – Network Analysis.

2. REQUIREMENTS OF THE DISTRICT

- 2.1.** All Contractors, Project Managers, Architects and its Disciplines, and Inspectors, are required to use the District provided Project Management Information System (PMIS) application to communicate and transmit all Project related documents such as, but not limited to: RFIs, Submittals, Change Order Requests, Construction Directives, Daily Reports, Inspection Requests, Drawings, Change Orders, and other Construction related documents including final record documents and/or drawings.

- 2.1.1. District will provide access to all required parties to utilize District provided PMIS.

2.2. DISTRICT FORMS

Request the current version of District forms from District Representative. If Project Management Information Software (PMIS) is utilized on the Project, then the District can upload the forms to the PMIS.

2.3. CONTRACTOR SUBMITTALS

All submittals required by the Contract Documents shall be submitted using the programs, processes and software indicated below. If no specific program or format is indicated, then Microsoft Word or Microsoft Excel is acceptable.

2.3.1. Preliminary Construction Schedule

- 2.3.1.1. Utilize Primavera P6 (P6) scheduling software (latest version) by Oracle or another program as pre-approved by the District.

2.3.2. Schedule of Values

2.3.2.1. Utilize District Schedule of Values form.

2.3.3. **Contractor's Completed Subcontractor List**

2.3.3.1. **Utilize Microsoft Excel**

2.3.4. **Contractor's Safety Plan**

2.3.5. **Schedule of Submittals**

2.3.5.1. Utilize P6 or another program as pre-approved by the District.

2.3.6. **Operations and Maintenance Manual & Instructions**

END OF DOCUMENT

DOCUMENT 01 20 00

PRICE AND PAYMENT PROCEDURES

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any).
- 1.1.4. 01 32 16 Construction Schedule – Network Analysis

1.2. DESCRIPTION

- 1.2.1. This Document contains procedures to be followed by the Contractor to request payment.
- 1.2.2. **IF THERE IS ANY INCONSISTENCY IN THIS DOCUMENT WITH THE PROVISIONS IN THE GENERAL CONDITIONS AND THE SPECIAL CONDITIONS THAT THE CONTRACTOR SHALL COMPLY WITH RELATED TO CHANGES AND/OR REQUESTS FOR CHANGES (e.g., “PAYMENTS,” “SCHEDULE OF VALUES”), THOSE PROVISIONS IN THE GENERAL CONDITIONS AND THE SPECIAL CONDITIONS SHALL TAKE PRECEDENCE.**

1.3. SECTION INCLUDES

- 1.3.1. Schedule of Values.
- 1.3.2. Application for Payment.

1.4. SCHEDULE OF VALUES

- 1.4.1. Provide a breakdown of the Contract Price with enough detail to facilitate continued evaluation of Applications for Payment and Progress Reports. Project may require use of one or more Applications for Payment (i.e. pending funding source or type of project).
- 1.4.2. Contractor must update and resubmit the Schedule of Values before the next Invoice or Application for Payment when approved Change Orders or Change Order Requests result in a change in the Contract Price.
- 1.4.3. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor’s Construction Schedule. Comply with the provisions in the General Conditions regarding the Schedule of Values.

- 1.4.3.1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - 1.4.3.1.1. Application for Payment forms.
 - 1.4.3.1.2. Submittal Schedule.
 - 1.4.3.1.3. Contractor's Construction Schedule.
- 1.4.3.2. Submit the Schedule of Values to District as indicated in the Contract Documents and, if an updated Schedule of Values is needed, then no later than ten (10) calendar days before the date scheduled for submittal of the next Application(s) for Payment. Schedule of Values to be submitted for each Project as defined by the District (i.e. Projects may be separated based on funding source).
- 1.4.3.3. Sub-schedules: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
- 1.4.4. 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.
 - 1.4.4.1. Identification: Include the following Project identification on the Schedule of Values:
 - 1.4.4.1.1. Project name and location.
 - 1.4.4.1.2. Name of District's Representative.
 - 1.4.4.1.3. District's contract number (_____).
 - 1.4.4.1.4. District's name and address.
 - 1.4.4.1.5. Date of submittal.
 - 1.4.4.2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - 1.4.4.2.1. Related Specification document, section or division.
 - 1.4.4.2.2. Description of the Work.
 - 1.4.4.2.3. Name of subcontractor.
 - 1.4.4.2.4. Name of manufacturer or fabricator.
 - 1.4.4.2.5. Name of supplier.
 - 1.4.4.2.6. Change Orders (numbers) that affect value.

1.4.4.2.7. Dollar value.

1.4.4.2.7.1. Percentage of the Contract Price to nearest one-hundredth percent, adjusted to total 100 percent.

1.4.4.3. Provide a breakdown of the Contract Price in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training.

1.4.4.4. Round amounts to nearest whole dollar; total shall equal the Contract Price.

1.4.4.5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

1.4.4.6. 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.

1.4.4.7. Allowances (if any): 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.

1.4.4.8. Each item in the Schedule of Values and Applications for Payments shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

1.4.5. Schedule Updating: Update and resubmit the Schedule of Values before the next Application for Payment if there is a change in the Contract Price.

1.5. APPLICATIONS FOR PAYMENT

1.5.1. **Form:** Contractor shall utilize District-approved form.

1.5.2. **Content and Format:** Contractor shall use Schedule of Values for listing items in its Application for Payment.

1.5.3. Each Application for Payment shall be consistent with previous applications and payments as approved and paid for by District.

END OF DOCUMENT

DOCUMENT 01 21 00

ALLOWANCES

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISION

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions including without limitation, Contract Terms and Definitions;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any).
- 1.1.4. Agreement;
- 1.1.5. Bid Form; and

1.2. SUMMARY

- 1.2.1. **THE SPECIFIC ALLOWANCES FOR THIS PROJECT ARE AS LISTED IN THE AGREEMENT.**
- 1.2.2. This Document includes administrative and procedural requirements governing Allowances.
- 1.2.3. Certain items are specified in the Contract Documents by Allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials, equipment, and labor to a later date when additional information is available for evaluation. If necessary, additional requirements may be issued by Change Order or similar document.

1.3. SELECTION AND PURCHASE

- 1.3.1. At the earliest practical date after award of the Contract, Contractor shall advise District of the date when final selection and purchase of each product or system described by an Allowance must be completed to avoid delaying the Work.
- 1.3.2. At District's request, obtain proposals for each Allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- 1.3.3. Purchase products and systems selected by District from the designated supplier.

1.4. SUBMITTALS

- 1.4.1. Submit proposals for purchase of products or systems included in Allowances, in the form specified for Change Order Requests.
- 1.4.2. Submit invoices or delivery slips to show actual quantities of materials delivered to the Site for use in fulfillment of each Allowance.

- 1.4.3. Coordinate and process submittals for Allowance items in same manner as for other portions of the Work.

1.5. COORDINATION

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

1.6. PAYMENT FOR ALLOWANCES

- 1.6.1. Allowance shall include all-inclusive cost to Contractor of specific products and materials under Allowance and Contractor may bill its time, materials, and other items in the identical structure as a Change Order Request.

1.7. UNUSED MATERIALS

- 1.7.1. Return unused materials purchased under an Allowance to manufacturer or supplier for credit to District, after installation has been completed and accepted. Contractor to use best efforts to negotiate return of unused materials, including re-stocking or other fees. Contractor to submit to District itemized list of unused materials including original cost and return credit, for review and approval in advance of return.
- 1.7.2. If requested, prepare and deliver unused material for storage by District when it is not economically practical (as determined by District) to return the material for credit. If directed, deliver unused material to District's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

2. EXECUTION

2.1. EXAMINATION

Examine products covered by an Allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

2.2. PREPARATION

Coordinate materials and their installation for each Allowance with related materials and installations to ensure that each Allowance item is completely integrated and interfaced with related work.

END OF DOCUMENT

DOCUMENT 01 23 00

ALTERNATES AND UNIT PRICING

1. ALTERNATES AND UNIT PRICES

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. Bid Form and Proposal; and
- 1.1.5. Instruction to Bidders.

2. ALTERNATES

2.1. DESCRIPTION

An amount proposed by Contractor and stated in its Bid Form for certain work defined in the Instruction to Bidders, Bid Form or Contract Documents that may be added to or deducted from the Base Bid amount. The acceptance or rejection of any of the alternates is strictly at the option of the District and subject to District's acceptance of Contractor's stated prices contained in this Proposal.

The cost or credit for each alternate is the net addition to or deduction from the Contract Price to incorporate the alternate into the Work. No other adjustments are made to the Contract Price.

2.2. GENERAL:

- 2.2.1. Coordination: Contractor shall modify or adjust adjacent work as necessary to completely integrate work of the alternate into the Project.
 - 2.2.1.1. Include as part of each alternate, miscellaneous devices, accessories and similar items incidental to or required for a complete installation whether or not indicated as part of the alternate.
 - 2.2.1.2. Include as part of each alternate, the costs of related coordination, modification, or adjustments.
- 2.2.2. If District accepts an alternate, Contractor shall perform the work of the alternate under the same conditions as other Work required by Contract Documents.
- 2.2.3. Notification: Immediately following award of the Contract, Contractor shall notify all of its Subcontractor(s) in writing of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

- 2.2.4. Schedule of Alternates: A Schedule of Alternates is included at the end of this Document. Specifications referenced in the Schedule of Alternates contain requirements for materials necessary to achieve the Work described under each alternate.

3. UNIT PRICING

3.1. DESCRIPTION

An amount proposed by Contractor and stated in its Bid Form for certain work defined in the Instruction to Bidders and Bid Form that may be priced by unit. The acceptance or rejection of any of the unit prices is strictly at the option of the District and subject to District's acceptance of Contractor's stated prices contained in the Bid Form and may be subsequently negotiated prior to incorporation on Change Order(s).

3.2. GENERAL

Contractor shall completely state all required figures based on Unit Prices required in the Bid Form. 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.

3.3. UNIT PRICES

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

4. EXECUTION

4.1. SCHEDULE OF ALTERNATES

- 4.1.1 No alternates in the scope of this project.

END OF DOCUMENT

DOCUMENT 01 25 10

PRODUCT OPTIONS AND SUBSTITUTIONS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any); and
- 1.1.4. Instructions to Bidders.

1.2. DOCUMENT INCLUDES

- 1.2.1. Product options.
- 1.2.2. Limitations on Substitutions.
- 1.2.3. Regulatory Requirements.
- 1.2.4. Substitution Representation.
- 1.2.5. Submittal Procedure.
- 1.2.6. District's Review.

1.3. DEFINITIONS

- 1.3.1. Requests for changes in products, materials, or equipment required by Contract Documents proposed by the Contractor prior to and after award of the Contract are considered requests for substitutions. Contractor must refer to the Instructions to Bidders, the General Conditions and the Special Conditions for limitations on when requests for substitution(s) are permitted on Project. Contractor proposed changes in products or materials required by the Contract Documents issued after the Notice to Proceed are considered to be requests for substitutions. District will consider requests for substitution if a product is no longer manufactured or the District and Architect, after a diligent search have verified that product or material is not available to the Contractor. The following are not considered substitutions:
 - 1.3.1.1. Revisions to Contract Documents requested by the District or Architect.
 - 1.3.1.2. Specified options of products, materials, and equipment included in Contract Documents.

- 1.3.2. Basis of Design Product Specification: Wherever in the Specifications a specific manufacturer's product is named and accompanied by the words "basis of design", 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 and will be used for purposes of evaluating comparable products submitted as substitutions.
- 1.3.3. Whenever in the Specifications any material, product, or service is indicated or specified by grade, patent, or proprietary name, or by name of manufacturer, that Specification shall be deemed to be used for the purpose of facilitating the description of the material, product, or service, and shall be deemed to be followed by the words "or equal," except:
 - 1.3.3.1. When designated to match other material, product, or service in use on a particular public improvement either completed or in the course of completion; or
 - 1.3.3.2. When designated as a field test or experiment.

1.4. PRODUCT OPTIONS

- 1.4.1. **Products Specified by Reference Standards or by Description Only:** Any Product meeting those standards or description.
- 1.4.2. **Products Specified by Naming One or More Manufacturers with or without Provision for Substitution:** Products of manufacturers named and meeting specifications with substitution of Products or manufacturer only when submitted under provisions of this section.

1.5. LIMITATIONS ON SUBSTITUTIONS

- 1.5.1. **Requests for substitution must be submitted with bid documents and shall only be permitted as indicated in and in accordance with requirements specified in the Instructions to Bidders and the Special Conditions.**
- 1.5.2. The Bid shall be based upon the standards of quality established by those items of equipment and/or materials which are specifically identified in the Contract Documents.
- 1.5.3. Burden of proof of merit of requested substitution is the responsibility of the Contractor.
- 1.5.4. It is the sole responsibility of Contractor to submit the proper content of any requests for substitutions at the time of bid submission.

1.6. REGULATORY REQUIREMENTS

- 1.6.1. It shall be the responsibility of Contractor to obtain all regulatory approvals required for proposed substitutions.
- 1.6.2. All regulatory approvals shall be obtained for proposed substitutions prior to submittal of substitution request to Architect.

- 1.6.3. All costs incurred by the District in obtaining regulatory approvals for proposed substitutions to include the costs of the Architect and any authority having jurisdiction over the Project shall be reimbursed to the District. Costs of these services shall be reimbursed regardless of final acceptance or rejection of substitution.
- 1.6.4. Substitutions of materials or work procedures which affect the health, safety and welfare of the public shall have prior approval of the Division of the State Architect (DSA) field representative.

1.7. SUBSTITUTION REPRESENTATION

- 1.7.1. In submitting a request for substitution, Contractor makes the representation that:
 - 1.7.1.1. Contractor has investigated the proposed substitution and determined that it meets or exceeds the quality level of the specified product;
 - 1.7.1.2. Contractor has determined that all components of the proposed substitution are identical and fully interchangeable with the product name and number specified;
 - 1.7.1.3. Contractor will provide the same warranty or guarantee for the substitution as for the specified product;
 - 1.7.1.4. Contractor will coordinate installation and make changes to other work which may be required for the work to be completed with no additional cost to the District;
 - 1.7.1.5. Contractor waives claims for additional cost or time extension which may subsequently become apparent; and
 - 1.7.1.6. Contractor will reimburse District for the cost of District's and Architect's review or redesign services associated with substitution request.

1.8. SUBMITTAL PROCEDURE

- 1.8.1. Submit one (1) copy of each request.
- 1.8.2. Submit request using District's Substitution Request Form as indicated in Contract Forms and Submittals. Substitution requests that are not on District's required form shall be returned without review.
- 1.8.3. Request to include sufficient data so that direct comparison of proposed substitution can be made.
- 1.8.4. Provide complete documentation for each request. Documentation shall include the following information, as appropriate, as a minimum:
 - 1.8.4.1. Statement of cause for substitution request.
 - 1.8.4.2. Identify product by specification section and article number.
 - 1.8.4.3. Provide manufacturer's name, address, and phone number. List fabricators,

suppliers, and installers as appropriate.

- 1.8.4.4. List similar projects where proposed substitution has been used, dates of installation and names of Architect and District.
 - 1.8.4.5. List availability of maintenance services and replacement materials.
 - 1.8.4.6. Documented or confirmation of regulatory approval.
 - 1.8.4.7. Product data, including drawings and descriptions of products.
 - 1.8.4.8. Fabrication and installation procedures.
 - 1.8.4.9. Samples of proposed substitutions.
 - 1.8.4.10. Itemized comparison of significant qualities of the proposed substitution with those of the product specified. Significant qualities may include size, weight, durability, performance requirements and visual effects.
 - 1.8.4.11. Coordination information, including a list of changes or modifications needed to other items of work that will become necessary to accommodate proposed substitution.
 - 1.8.4.12. Statement on the substitutions effect on the Construction Schedule.
 - 1.8.4.13. Cost information including a proposal of the net reduction in cost to the Contract Price if the proposed substitution is accepted.
 - 1.8.4.14. Certification that the substitution is equal to or better in every respect to that required by the Contract Documents and that substitution will perform adequately in the application intended.
 - 1.8.4.15. Waiver of right to additional payment or time that may subsequently become necessary because of failure of substitution to perform adequately.
- 1.8.5. Inadequate warranty, vagueness of submittal, failure to meet specified requirements, or submittal of insufficient data will be cause for rejection of substitution request.

1.9. DISTRICT'S REVIEW

- 1.9.1. The District will accept or reject proposed substitution within a reasonable amount of time.
- 1.9.2. If a request is made prior to bid opening and the District has not completed its review, Contractor shall base its bid on the product specified only.
- 1.9.3. There shall be no claim for additional time for review of proposed substitutions.
- 1.9.4. Final acceptance of a substitution submitted prior to the date established for the receipt of bids will be in the form of an addendum.

END OF DOCUMENT

DOCUMENT 01 26 00

CONTRACT MODIFICATION PROCEDURES

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. 01 21 00 Allowances;
- 1.1.5. 01 25 10 Product Options and Substitutions; and
- 1.1.6. 01 31 00 Coordination and Project Meetings
- 1.1.7. 01 32 16 Construction Schedule – Network Analysis

1.2. DESCRIPTION

- 1.2.1. This Document contains procedures to be followed by the Contractor to request changes in the Contract Time and/or the Contract Price.
- 1.2.2. **IF THERE IS ANY INCONSISTENCY IN THIS DOCUMENT WITH THE PROVISIONS IN THE GENERAL CONDITIONS AND THE SPECIAL CONDITIONS THAT THE CONTRACTOR SHALL COMPLY WITH RELATED TO CHANGES AND/OR REQUESTS FOR CHANGES (e.g., “Change in the Work”), THOSE PROVISIONS IN THE GENERAL CONDITIONS AND THE SPECIAL CONDITIONS SHALL TAKE PRECEDENCE.**

1.3. SUMMARY

This Document specifies administrative and procedural requirements for handling and processing Contract modifications.

1.4. CONSTRUCTION DIRECTIVE

The District may as provided by law, by Construction Directive and without invalidating the Contract, order changes in the Work consisting of additions, deletions, or other revisions.

1.5. REQUEST FOR PROPOSAL (RFP)

Request for Proposal (RFP) shall be submitted via electronic-mail or other method of written notification. Do not consider Request for Proposals to be instructions either to stop work in progress or to execute the proposed change.

1.5.1. Within time specified in Request for Proposals, after receipt of Request for Proposals, submit a quotation estimating cost adjustments to the Contract Price and the Contract Time necessary to execute the change.

1.5.1.1. 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.

1.5.1.2. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

1.5.1.3. Include costs of labor and supervision directly attributable to the change.

1.5.1.4. 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.

1.6. CHANGE ORDER REQUESTS (COR)

Contractor may propose changes by submitting a request for a change on District's Change Order Request form (COR) to District.

1.6.1. 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.

1.6.2. Comply with Contract Document requirements if the proposed change requires substitution of one product or system for product or system specified.

END OF DOCUMENT

DOCUMENT 01 26 10

REQUESTS FOR INFORMATION

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. Documentation Requirements;
- 1.1.5. Electronic Data Transfer;
- 1.1.6. 01 33 00 Submittals;
- 1.1.7. 01 77 00 Contract Closeout and Final Cleaning;
- 1.1.8. 01 78 23 Operation and Maintenance Data;
- 1.1.9. 01 78 36 Warranties; and
- 1.1.10. 01 78 39 Record Documents;

1.2. DESCRIPTION

This Document contains procedures to be followed by the Contractor to request Architect provide additional information necessary to clarify or amplify an item in the Contract Documents that Contractor thinks is not clearly shown or called for in the Drawings or Specifications or other portions of the Contract Documents, or to address issues that have arisen under field conditions.

1.3. PROCEDURES

- 1.3.1. Notification by Contractor:
 - 1.3.1.1. All Contractors, Project Managers, Architects and its Disciplines, and Inspectors are required to use the District provided Project Management Information System (PMIS) Application to communicate and transmit all Project related documents such as, but not limited to: RFIs, Submittals, Change Order Requests, Construction Directives, Daily Reports, Inspection Requests, Drawings, Change Orders, and other Construction related documents including final record documents and/or drawings.
 - 1.3.1.2. Submit all requirements for clarification or additional information, whether originated by the Contractor, a Subcontractor, or supplier at any tier, in writing to District as required by the Contract Documents.

- 1.3.1.3. Number RFIs sequentially. Follow RFI number with sequential numeric suffix as necessary for each resubmission. For example, the first RFI would be "0001." The second RFI would be "0002."
- 1.3.1.4. All RFIs shall reference all applicable Contract Document(s), including Specification section(s), detail(s), page number(s), drawing number(s), and sheet number(s), etc. Contractor shall make suggestions and interpretations of the issue raised by each RFI. An RFI cannot modify the Contract Price, Contract Time, or the Contract Documents.
- 1.3.1.5. Limit each RFI to one subject.
- 1.3.1.6. Submit a RFI if one of the following conditions occurs:
 - 1.3.1.6.1. Contractor discovers an unforeseen condition or circumstance that is not described in the Contract Documents.
 - 1.3.1.6.2. Contractor discovers an apparent conflict or discrepancy between portions of the Contract Documents that appears to be inconsistent or is not reasonably inferred from the intent of the Contract Documents.
- 1.3.2. Contractor shall not:
 - 1.3.2.1. Submit an RFI as a request for substitution.
 - 1.3.2.2. Submit an RFI as a submittal.
 - 1.3.2.3. Submit an RFI without first having thoroughly reviewed the Contract Documents.
 - 1.3.2.4. Submit an RFI in a manner that suggests that specific portions of the Contract Documents are assumed to be excluded or by taking an isolated portion of the Contract Documents in part rather than whole.
 - 1.3.2.5. Submit an RFI in an untimely manner without proper coordination and scheduling of Work related trades.
 - 1.3.2.6. If Contractor submits an RFI contrary to the above, Contractor shall pay the cost of any review, which cost shall be deducted from the Contract Price.
- 1.3.3. Contractor shall be liable to the District for all costs incurred by the District associated with the processing, reviewing, evaluating and responding to any RFI, including without limitation, fees of the Architect and any other design consultant to the Architect or the District, that District reasonably determines:
 - 1.3.3.1. Does not reflect adequate or competent supervision or coordination by the Contractor or any Subcontractor; or

1.3.3.2. Does not reflect the Contractor's adequate or competent knowledge of the requirements of the Work or the Contract Documents;

1.3.3.3. Requests an interpretation or decision of a matter where the information sought is equally available to the Contractor; or

1.3.3.4. Is not justified for any other reason.

1.4. RESPONSE TIME

1.4.1. Architect shall review RFIs and issue a response and instructions to Contractor within seven (7) calendar days from the date the RFI is received and dated by the District.

1.4.2. Responses from the District will not change any requirement of the Contract unless so noted by the District in the response to the RFI. Should the Contractor contend that a response to an RFI causes a change to the Contract that requires a Change Order, the Contractor shall, before proceeding, give written notice to the District within three (3) business days, indicating that the Contractor considers the District's response to the RFI to be a Change Order, as required by the Contract Documents.

1.4.3. Should Contractor direct its Subcontractors to proceed with the Work affected before receipt of a response from Architect, any portion of the Work which is not done in accordance with the Architect's ultimate interpretations, clarifications, instructions, or decisions is subject to removal or replacement at Contractor's sole expense and responsibility.

END OF DOCUMENT

DOCUMENT 01 31 00

COORDINATION AND PROJECT MEETINGS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS:

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. Technical Specifications.
- 1.1.5. 01 32 16 Construction Schedule – Network Analysis
- 1.1.6. 01 33 00 Submittals

1.2. SECTION INCLUDES

- 1.2.1. Coordination Responsibilities of the Contractor.
- 1.2.2. Field Engineering Responsibilities of the Contractor.
- 1.2.3. Preconstruction Conference.
- 1.2.4. Progress Meetings.
- 1.2.5. Pre-Installation Conferences.
- 1.2.6. Post Construction Dedication.

1.3. COORDINATION RESPONSIBILITIES OF THE CONTRACTOR

- 1.3.1. Coordinate scheduling, submittals, and Work of the Specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- 1.3.2. Prior to commencement of a particular type or kind of Work examine relevant information, contract documents, and subsequent data issued to the Project.
- 1.3.3. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate Work of various sections having interdependent responsibilities for installing, connecting to, and placing in service such equipment.
- 1.3.4. Closing up of holes, backfilling, and other covering up operations shall not proceed until all enclosed or covered Work and inspections have been completed. Verify before

proceeding.

- 1.3.5. Coordinate space requirements and installation of mechanical and electrical Work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- 1.3.6. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- 1.3.7. In locations where several elements of mechanical and electrical Work must be sequenced and positioned with precision in order to fit into available space, prepare coordination drawings showing the actual conditions required for the installation. Prepare coordination drawings prior to purchasing, fabricating, or installing any of the elements required to be coordinated.
- 1.3.8. Closing up of walls, partitions or furred spaces, backfilling, and other covering up operations shall not proceed until all enclosed or covered Work and inspections have been completed. Verify before proceeding.
- 1.3.9. Coordinate completion and cleanup of Work of separate sections in preparation for completion and for portions of Work designated for District's occupancy.
- 1.3.10. After District occupancy of Project, coordinate access to Site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of District's activities.
- 1.3.11. Coordinate all utility company Work in accordance with the Contract Documents.
- 1.3.12. Key Personnel Names: Within fifteen (15) calendar days prior to 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 and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.4. FIELD ENGINEERING RESPONSIBILITIES OF THE CONTRACTOR

- 1.4.1. Contractor shall employ a Land Surveyor registered in the State of California and acceptable to the Architect.
- 1.4.2. Control datum for survey is that established by District provided survey. Contractor to locate and protect survey control and reference points.
- 1.4.3. Replace dislocated survey control points based on original survey control.
- 1.4.4. Provide field engineering services. Establish elevations, lines, and levels utilizing recognized engineering survey practices.

- 1.4.5. Upon completion of Work, submit certificate signed by the Land Surveyor that elevations and locations of Work are in conformance with Contract Documents. Record deviations on Record Drawings.

1.5. PRECONSTRUCTION CONFERENCE

- 1.5.1. Construction Manager or Project Engineer will schedule a conference immediately after, and in no case more than fifteen (15) calendar days after, receipt of fully executed Contract Documents prior to Project mobilization.
- 1.5.2. Mandatory Attendance: Construction Manager, Project Engineer, Project Inspector, Architect of Record, Contractor, Contractor's Project Manager, and Contractor's Job/Project Superintendent.
- 1.5.3. Optional Attendance: Architect's consultants, and utility company representatives.
- 1.5.4. Construction Manager shall preside at conference and prepare and record minutes and distribute copies.
- 1.5.5. Agenda:
 - 1.5.5.1. Execution of Owner-Contractor Agreement.
 - 1.5.5.2. Issue Notice to Proceed.
 - 1.5.5.3. Submission of executed bonds and insurance certificates.
 - 1.5.5.4. Distribution of Contract Documents.
 - 1.5.5.5. Submission of list of Subcontractors, list of Products, Schedule of Values, and Progress Schedule.
 - 1.5.5.6. Designation of responsible personnel representing the parties.
 - 1.5.5.7. Procedures for processing Change Orders.
 - 1.5.5.8. Procedures for Request for Information.
 - 1.5.5.9. Procedures for testing and inspecting.
 - 1.5.5.10. Procedures for processing applications for payment.
 - 1.5.5.11. Procedures for Project closeout.
 - 1.5.5.12. Use of Premises.
 - 1.5.5.13. Work restrictions.
 - 1.5.5.14. District's occupancy requirements or options.
 - 1.5.5.15. Responsibility for temporary facilities and controls.

1.5.5.16. Construction waste management and recycling.

1.5.5.17. Parking availability.

1.5.5.18. Office, work and storage areas.

1.5.5.19. Equipment deliveries and priority.

1.5.5.20. Security.

1.5.5.21. Progress cleaning.

1.5.5.22. Review required submittals.

1.6. PROGRESS MEETINGS

1.6.1. Construction Manager shall schedule and administer meetings throughout progress of the Work at a minimum of every week.

1.6.2. Construction Manager or Project Engineer will make arrangements for meetings, prepare agenda, and preside at meetings as well as record minutes and distribute copies.

1.6.3. Attendance Required: Job Superintendent, Construction Manager, Project Engineer, Project Inspector, Architect of Record, Subcontractors, and suppliers as appropriate to agenda topics for each meeting.

1.6.4. Agenda:

1.6.4.1. Review minutes of previous meetings (Field Reports).

1.6.4.2. Review of Work progress.

1.6.4.3. Field observations, problems, and decisions.

1.6.4.4. Identification of problems which impede planned progress.

1.6.4.5. Review of submittals schedule and status of submittals.

1.6.4.6. Review of off-site fabrication and delivery schedules.

1.6.4.7. Maintenance of construction schedule.

1.6.4.8. Corrective measures to regain projected schedules.

1.6.4.9. Planned progress during succeeding work period.

1.6.4.10. Coordination of projected progress.

1.6.4.11. Maintenance of quality and work standards.

1.6.4.12. Effect of proposed changes on progress schedule and coordination.

1.6.4.13. Other business relating to Work.

1.6.5. District has authority to schedule mandatory meetings other than those listed, as necessary.

1.7. PRE-INSTALLATION CONFERENCES

1.7.1. When required in individual specification section, Construction Manager and/or Contractor shall convene a pre-installation conference prior to commencing Work of the section. Refer to individual specification section for timing requirements of conference.

1.7.2. Contractor shall require its Subcontractors and suppliers directly affecting, or affected by, Work of the specific section to attend.

1.7.3. Notify the Construction Manager, Project Engineer, Project Inspector, and Architect of Record a minimum of five (5) business days in advance of meeting date.

1.7.4. A pre-installation conference may coincide with a regularly scheduled progress meeting.

1.7.5. Construction Manager shall prepare agenda, preside at conference, record minutes, and distribute copies within three (3) calendar days after conference to participants.

1.7.6. The purpose of the meeting will be to review Contract Documents, conditions of installation, preparation and installation procedures, and coordination with related Work and manufacturer's recommendations.

1.7.7. Pre-installation Schedule: As a minimum, Work being installed under the Contract Documents technical sections will require pre-installation conferences. Contractor shall review the technical specifications and add all additional requirements for pre-installation meetings contained in those sections.

1.8. POST CONSTRUCTION DEDICATION

1.8.1. Attendance Required: Project Superintendent, Contractor, Project Manager, major Subcontractors, Construction Manager, Project Engineer, Project Inspector, and Architect of Record.

1.8.2. Preparation prior to Dedication: Contractor and appropriate Subcontractors and suppliers shall:

1.8.2.1. Assist District in operation of mechanical devices and systems.

1.8.2.2. Verify operation and adjust controls for communication systems.

1.8.2.3. Assist District in operation of lighting systems.

END OF DOCUMENT

DOCUMENT 01 32 16

CONSTRUCTION SCHEDULE – NETWORK ANALYSIS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISION

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. 01 31 00 Coordination and Meetings; and
- 1.1.5. 01 33 00 Submittals.

1.2. REFERENCES

- 1.2.1. Construction Planning and Scheduling Manual - A Manual for General Contractors and the Construction Industry, The Associated General Contractors of America (AGC).
- 1.2.2. CSI - Construction Specifications Institute MP-2-1 Master Format.
- 1.2.3. U.S. National Weather Service - Local Climatological Data.

1.3. PERFORMANCE REQUIREMENTS

- 1.3.1. Ensure adequate scheduling during construction activities so Work may be prosecuted in an orderly and expeditious manner within stipulated Contract Time.
- 1.3.2. Ensure coordination of Contractor and Subcontractors at all levels.
- 1.3.3. Ensure coordination of submittals, fabrication, delivery, erection, installation, and testing of products, materials and equipment.
- 1.3.4. Ensure on-time delivery of District furnished products, materials and equipment.
- 1.3.5. Ensure coordination of jurisdictional reviews.
- 1.3.6. Prepare applications for payment.
- 1.3.7. Monitor progress of Work.
- 1.3.8. Prepare proper requests for changes to Contract Time.
- 1.3.9. Prepare proper requests for changes to Construction Schedule.

- 1.3.10. Assist in detection of schedule delays and identification of corrective actions.

1.4. QUALITY ASSURANCE

- 1.4.1. Perform scheduling work in accordance with Construction Planning and Scheduling Manual published by the AGC.
- 1.4.2. Maintain one copy of Construction Planning and Scheduling Manual on Site.
- 1.4.3. In the event of discrepancy between the AGC publication and the Contract Documents, provisions of the Contract Documents shall govern.

1.5. QUALIFICATIONS

1.5.1. Scheduler:

- 1.5.1.1. Contractor shall retain a construction scheduler to work in enough capacity to perform all of the Contractor's requirements to prepare the Construction Schedule. The Scheduler shall plan, coordinate, execute, and monitor a cost/resource loaded CPM schedule as required for Project and have a minimum of five (5) years direct experience using Primavera Project Management.
- 1.5.1.2. Scheduler will cooperate with District and shall be available on site for monitoring, maintaining and updating schedules in a timely manner.
- 1.5.1.3. District has the right to reject the Scheduler based upon a lack of experience as required by this Document or based on lack of performance and timeliness of schedule submittals/fragnets on past projects. Contractor shall within seven (7) calendar days of District's rejection, propose another scheduler who meets the experience requirements stated above.

- 1.5.2. **Administrative Personnel:** Five (5) years minimum experience in using and monitoring schedules on comparable projects.

1.6. SUBMITTALS

- 1.6.1. Submit Short Interval Schedule at each Construction Progress Meeting.
- 1.6.2. Submit Time Adjustment Schedule within five (5) business days of commencement of a claimed delay.
- 1.6.3. Submit Recovery Schedules as required for timely completion of Work or when demanded by the District.
- 1.6.4. Submit job cost reports when demanded by the District.
- 1.6.5. Submit one (1) reproducible and two (2) copies of each schedule and cost report.
- 1.6.6. Submit large format plotted schedules monthly or at the request of the District or Construction Manager.

1.7. REVIEW AND EVALUATION

- 1.7.1. Contractor shall participate in joint review of Construction Schedule and Reports with District and Architect.
- 1.7.2. Within seven (7) business days of receipt of District and/or Architect's comments, provide satisfactory revision to Construction Schedule or adequate justification for activities in question.
- 1.7.3. In the event that an activity or element of Work is not detected by District or Architect review, such omission or error shall be corrected by next scheduled update and shall not affect Contract Time.
- 1.7.4. Acceptance by District of corrected Construction Schedule shall be a condition precedent to making any progress payments.
- 1.7.5. Cost-loaded values of Construction Schedule shall be basis for determining progress payments.
- 1.7.6. Review and acceptance by District and Architect of Preliminary Construction Schedule or Construction Schedule does not constitute responsibility whatsoever for accuracy or feasibility of schedules nor does such acceptance expressly or impliedly warrant, acknowledge or admit reasonableness of activities, logic, duration, manpower, cost or equipment loading stated or implied on schedules.

1.8. FORMAT

- 1.8.1. Prepare diagrams and supporting mathematical analyses using Precedence Diagramming Method, under concepts and methods outlined in AGC Construction Planning and Scheduling Manual, or other method pre-approved by District.
- 1.8.2. **Listings:** Reading from left to right, in ascending order for each activity.
- 1.8.3. **Diagram Size:** 42 inches maximum height x width required.
- 1.8.4. **Scale and Spacing:** To allow for legible notations and revisions.
- 1.8.5. Illustrate order and interdependence of activities and sequence of Work.
- 1.8.6. Illustrate complete sequence of construction by activity.
- 1.8.7. Provide legend of symbols and abbreviations used.

1.9. COST AND SCHEDULE REPORTS

- 1.9.1. **Activity Analysis:** Tabulate each activity of network diagram and identify for each activity:
 - 1.9.1.1. Description.

- 1.9.1.2. Interface with outside contractors or agencies.
- 1.9.1.3. Number.
- 1.9.1.4. Preceding and following number.
- 1.9.1.5. Duration.
- 1.9.1.6. Earliest start date.
- 1.9.1.7. Earliest finish date.
- 1.9.1.8. Actual start date.
- 1.9.1.9. Actual finish date.
- 1.9.1.10. Latest start date.
- 1.9.1.11. Latest finish date.
- 1.9.1.12. Total and free float.
- 1.9.1.13. Identification of critical path activity.
- 1.9.1.14. Monetary value keyed to Schedule of Values.
- 1.9.1.15. Manpower requirements.
- 1.9.1.16. Responsibility.
- 1.9.1.17. Percentage complete.
- 1.9.1.18. Variance positive or negative.
- 1.9.2. **Cost Report:** Tabulate each activity of network diagram and identify for each activity:
 - 1.9.2.1. Description.
 - 1.9.2.2. Number.
 - 1.9.2.3. Total cost.
 - 1.9.2.4. Percentage complete.
 - 1.9.2.5. Value prior to current period.
 - 1.9.2.6. Value this period.
 - 1.9.2.7. Value to date.
- 1.9.3. **Required Sorts:** List activities in sorts or groups:

- 1.9.3.1. By activity number.
- 1.9.3.2. By amount of float time in order of early start.
- 1.9.3.3. By responsibility in order of earliest start date.
- 1.9.3.4. In order of latest start dates.
- 1.9.3.5. In order of latest finish dates.
- 1.9.3.6. Application for payment sorted by Schedule of Values.
- 1.9.3.7. Listing of activities on critical path.
- 1.9.4. Listing of basic input data which generates schedule.

1.10. CONSTRUCTION SCHEDULE

- 1.10.1. Contractor shall develop and submit a cost loaded preliminary schedule of construction (or Preliminary Construction Schedule) as required by this Document and the Contract Documents. It shall be submitted in computer generated network format and shall be organized by Activity Codes representing the intended sequencing of the Work, and with time scaled network diagrams of activities. The Preliminary Construction Schedule shall include activities such as mobilization, preparation of submittals, specified review periods, procurement items, fabrication items, milestones, and all detailed construction activities.
- 1.10.2. Upon District's acceptance of the Preliminary Construction Schedule, Contractor shall update the accepted Preliminary Construction Schedule until Contractor's Construction Schedule is fully developed and accepted. Since updates to the Construction Schedule are the basis for payment to Contractor, submittal and acceptance of the Construction Schedule and updates shall be a condition precedent to making of monthly payments, as indicated in the General Conditions.
- 1.10.3. Failure to submit an adequate or accurate Preliminary Construction Schedule, Construction Schedule, updates thereto or failure to submit on established dates, will be considered a breach of Contract.
- 1.10.4. Failure to include any activity shall not be an excuse for completing all Work by required Completion Date.
- 1.10.5. Activities of long intervals shall be broken into increments no longer than fourteen (14) calendar days or a value over \$20,000.00, unless approved by the District or it is a non-construction activity for procurement and delivery.
- 1.10.6. The Construction Schedule shall comply with the following and include the following:
 - 1.10.6.1. Provide a written narrative describing Contractor's approach to mobilization, procurement, and construction during the first thirty (30) calendar days including crew sizes, equipment and material delivery, Site access, submittals,

and permits.

- 1.10.6.2. Shall designate critical path or paths.
- 1.10.6.3. Procurement activities to include mobilization, shop drawings and sample submittals.
- 1.10.6.4. Identification of key and long-lead elements and realistic delivery dates.
- 1.10.6.5. Construction activities in units of whole days limited to fourteen (14) calendar days for each activity except non-construction activities for procurement and delivery.
- 1.10.6.6. Approximate cost and duration of each activity.
- 1.10.6.7. Shall contain seasonal weather considerations.
- 1.10.6.8. Indicate a date for Project Completion that is no later than Completion Date subject to any time extensions processed as part of a Change Order.
- 1.10.6.9. Conform to mandatory dates specified in the Contract Documents.
- 1.10.6.10. Contractor shall allow for inclement weather in the Proposed Baseline Schedule by incorporating an activity titled "Rain Day Impact Allowance" as the last activity prior to the Completion Milestone. No other activities may be concurrent with it. The duration of the Rain Day Impact Allowance activity will be in accordance with the Special Conditions, and will be calculated from the Notice to Proceed until the Completion.
- 1.10.6.11. Level of detail shall correspond to complexity of work involved.
- 1.10.6.12. Indicate procurement activities, delivery, and installation of District furnished material and equipment.
- 1.10.6.13. Designate critical path or paths.
- 1.10.6.14. Subcontractor work at all levels shall be included in schedule.
- 1.10.6.15. As developed, shall show sequence and interdependence of activities required for complete performance of Work.
- 1.10.6.16. Shall be logical and show a coordinated plan of Work.
- 1.10.6.17. Show order of activities and major points of interface, including specific dates of completion.
- 1.10.6.18. Duration of activities shall be coordinated with Subcontractors and suppliers and shall be best estimate of time required.
- 1.10.6.19. Shall show description, duration and float for each activity.

- 1.10.7. **Activity.** An activity shall meet the following criteria:

- 1.10.7.1. Any portion or element of Work, action, or reaction that is precisely described, readily identifiable, and is a function of a logical sequential process.
- 1.10.7.2. Descriptions shall be clear and concise. Beginning and end shall be readily verifiable. Starts and finishes shall be scheduled by logical restraints.
- 1.10.7.3. Responsibility shall be identified with a single performing entity.
- 1.10.7.4. Additional codes shall identify building, floor, bid opening and/or District's receipt of proposals, whichever is acceptable and CSI classification.
- 1.10.7.5. Assigned dollar value (cost-loading) of each activity shall cumulatively equal total contract amount. Mobilization, bond and insurance costs shall be separate. General requirement costs, overhead, profit, shall be prorated throughout all activities. Activity costs shall correlate with Schedule of Values.
- 1.10.7.6. Each activity shall have manpower-loading assigned.
- 1.10.7.7. Major construction equipment shall be assigned to each activity.
- 1.10.7.8. Activities labeled start, continue or completion are not allowed.
- 1.10.8. **Equipment and Materials.** For major equipment and materials show a sequence of activities including:
 - 1.10.8.1. Preparation of shop drawings and sample submissions.
 - 1.10.8.2. Review of shop drawings and samples.
 - 1.10.8.3. Finish and color selection.
 - 1.10.8.4. Fabrication and delivery.
 - 1.10.8.5. Erection or installation.
 - 1.10.8.6. Testing.
- 1.10.9. Include a minimum of fifteen (15) calendar days prior to Completion Date for punch lists and clean up. No other activities shall be scheduled during this period.

1.11. SHORT INTERVAL SCHEDULE

- 1.11.1. The Four-Week Rolling Schedule shall be based on the most recent District Accepted Construction Schedule or Update. It shall include weekly updates to all construction, submittal, fabrication/procurement, and separate Work Contract activities. Contractor shall ensure that it accurately reflects the current progress of the Work.
- 1.11.2. Shall be fully developed horizontal bar-chart-type schedule directly derived from

Construction Schedule.

- 1.11.3. Prepare schedule on sheet of sufficient width to clearly show data.
- 1.11.4. Provide continuous heavy vertical line identifying first day of week.
- 1.11.5. Provide continuous subordinate vertical line identifying each day of week.
- 1.11.6. Identify activities by same activity number and description as Construction Schedule.
- 1.11.7. Show each activity in proper sequence.
- 1.11.8. Indicate graphically sequences necessary for related activities.
- 1.11.9. Indicate activities completed or in progress for previous two (2) week period.
- 1.11.10. Indicate activities scheduled for succeeding three (3) week period.
- 1.11.11. Further detail should be added if necessary to monitor schedule or if requested by District.

1.12. REQUESTED TIME ADJUSTMENT SCHEDULE

- 1.12.1. Updated Construction Schedule shall not show a Completion Date later than the Contract Time, subject to any time extensions processed as part of a Change Order.
- 1.12.2. If an extension of time is requested, a separate schedule entitled "Requested Time Adjustment Schedule" shall be submitted to District and Architect.
- 1.12.3. Indicate requested adjustments in Contract Time which are due to changes or delays in completion of Work.
- 1.12.4. Extension request shall include forecast of Project Completion date and actual achievement of any dates listed in Contract Documents.
- 1.12.5. To the extent that any requests are pending at time of any Construction Schedule update, Time Adjustment Schedule shall also be updated.
- 1.12.6. Schedule shall be a time-scaled network analysis.
- 1.12.7. Accompany schedule with formal written time extension request and detailed impact analysis justifying extension.
- 1.12.8. Time impact analysis shall demonstrate time impact based upon date of delay, and status of construction at that time and event time computation of all affected activities. Event times shall be those as shown in latest Construction Schedule.
- 1.12.9. Activity delays shall not automatically constitute an extension of Contract Time.
- 1.12.10. Failure of Subcontractors shall not be justification for an extension of time.

- 1.12.11. Float is not for the exclusive use or benefit of any single party. Float time shall be apportioned according to needs of Project, as determined by the District.
- 1.12.12. Float suppression techniques such as preferential sequencing, special lead/lag logic restraints, extended activity durations, or imposed dates shall be apportioned according to benefit of Project.
- 1.12.13. Extensions will be granted only to extent that time adjustments to activities exceed total positive float of the critical path and extends Completion date.
- 1.12.14. District shall not have an obligation to consider any time extension request unless requirements of Contract Documents, and specifically, but not limited to these requirements, are complied with.
- 1.12.15. District shall not be responsible or liable for any construction acceleration due to failure of District to grant time extensions under Contract Documents should requested adjustments in Contract Time not substantially comply with submission and justification requirements of Contract for time extension requests.
- 1.12.16. In the event a Requested Time Adjustment Schedule and Time Impact Analysis are not submitted within ten (10) business days after commencement of a delay it is mutually agreed that delay does not require a Contract Time extension.

1.13. RECOVERY SCHEDULE

- 1.13.1. When activities are behind Construction Schedule a supplementary Recovery Schedule shall be submitted.
- 1.13.2. Contractor shall prepare and submit to the District a Recovery Schedule whenever activities are behind Construction Schedule or at any time requested by the District, at no cost to the District.
- 1.13.3. Form and detail shall be sufficient to explain and display how activities will be rescheduled to regain compliance with Construction Schedule and to complete the Work by the Completion Date.
- 1.13.4. Maximum duration shall be one (1) month and shall coincide with payment period.
- 1.13.5. Ten (10) business days prior to expiration of Recovery Schedule, Contractor shall have to show verification to determine if activities have regained compliance with Construction Schedule. Based upon this verification the following will occur:
 - 1.13.5.1. Supplemental Recovery Schedule will be submitted to address subsequent payment period.
 - 1.13.5.2. Construction Schedule will be resumed.

1.14. UPDATING SCHEDULES

- 1.14.1. Review and update schedules at least ten (10) calendar days prior to submitting an Application for Payment.

- 1.14.2. Maintain schedules to record actual prosecution and progress.
- 1.14.3. Approved Change Orders which affect schedules shall be identified as separate new activities.
- 1.14.4. Change Orders of less than \$5,000.00 value or less than three (3) days duration need not be shown unless critical path is affected.
- 1.14.5. No other revisions shall be made to schedules unless authorized by District.
- 1.14.6. **Schedule Narrative Report:** Contractor shall include a written report to explain the Monthly Schedule Update. The narrative shall, at a minimum, include the following headings with appropriate discussions of each topic:
 - 1.14.6.1. Activities or portions of activities completed during previous reporting period.
 - 1.14.6.2. Actual start dates for activities currently in progress.
 - 1.14.6.3. Deviations from critical path in days ahead or behind.
 - 1.14.6.4. List of major construction equipment used during reporting period and any equipment idle.
 - 1.14.6.5. Number of personnel by trade engaged on Work during reporting period.
 - 1.14.6.6. Progress analysis describing problem areas.
 - 1.14.6.7. Current and anticipated delay factors and their impact.
 - 1.14.6.8. Proposed corrective actions and logic revisions for Recovery Schedule.
 - 1.14.6.9. Proposed modifications, additions, deletions and changes in logic of Construction Schedule.
 - 1.14.6.10. In updating the Schedule, Contractor shall not modify Activity ID numbers, schedule calculation rules/criteria, or the Activity Coding Structure required.
- 1.14.7. Schedule update will form basis upon which progress payments will be made.
- 1.14.8. District will not be obligated to review or process Application for Payment until the Construction Schedule and Schedule Narrative Report have been submitted.

1.15. DISTRIBUTION

- 1.15.1. Following joint review and acceptance of updated schedules distribute copies to District, Architect, and all other concerned parties.
- 1.15.2. Instruct recipients to promptly report in writing any problem anticipated by projections shown in schedules.

2. PRODUCTS

2.1. SCHEDULING SOFTWARE

Contractor shall utilize District-approved software and shall employ the Critical Path Method (CPM) in the development and maintenance of the Construction Schedule. The scheduling software shall be capable of being resource loaded with manpower, costs and materials. It shall also be capable of generating time-scaled logic diagrams, resource histograms and profiles, bar charts, layouts and reports with any and/or all activity detail.

2.2. ELECTRONIC DATA

Provide electronic submission with Proposed Baseline Schedule data on it and in a format approved by the District.

END OF DOCUMENT

DOCUMENT 01 33 00

SUBMITTALS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISION

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions;
- 1.1.2. Special Conditions;
- 1.1.3. Instructions to Bidders;
- 1.1.4. 01 11 00 Summary of Work;
- 1.1.5. 01 12 10 Contract Forms and Submittals;
- 1.1.6. 01 25 10 Product Options and Substitutions;
- 1.1.7. 01 26 10 Requests for Information;
- 1.1.8. 01 77 00 Contract Closeout and Final Cleaning;
- 1.1.9. 01 78 23 Operation and Maintenance Data;
- 1.1.10. 01 78 36 Warranties;
- 1.1.11. 01 78 39 Record Documents;
- 1.1.12. Demonstration and Training;

1.2. DOCUMENT INCLUDES

- 1.2.1. Submittal procedures – Use of District approved Project Management Information System (PMIS).
- 1.2.2. Shop drawings.
- 1.2.3. District PMIS (or another District pre-approved program) Electronic Submittal Process
- 1.2.4. Product data.
- 1.2.5. Samples.
- 1.2.6. Manufacturers' Instructions.
- 1.2.7. Manufacturers' Certificates.

- 1.2.8. Mock-Up.
- 1.2.9. Deferred approval requirements.

1.3. SUBMITTAL PROCEDURES – USE PROJECT MANAGEMENT INFORMATION SYSTEM (PMIS)

- 1.3.1 **Contractor shall utilize District-approved software** for the submittal process.
Contractor shall transmit each submittal in conformance with requirements of this Document. All Contractors, Project Managers, Architects and its Disciplines, and Inspectors are required to use the District provided Project Management Information System (PMIS) Application to communicate and transmit all Project related documents such as, but not limited to: RFIs, Submittals, Change Order Requests, Construction Directives, Daily Reports, Inspection Requests, Drawings, Change Orders, and other Construction related documents including final record documents and/or drawings. For each submittal, Contractor shall:
 - 1.3.1.1. Sequentially number the transmittal forms. Resubmitted submittals must have the original number with a numeric suffix;
 - 1.3.1.2. Identify Project and Architect's project number, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate;
 - 1.3.1.3. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the Work and Contract Documents. Submittals without Contractor's stamp and signature will be returned without review.
- 1.3.2. Coordinate preparation and processing of submittals with performance of Work. Transmit each submittal sufficiently in advance of performance of Work to avoid delay.
 - 1.3.2.1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 1.3.2.2. Coordinate transmittal of different types of submittals for related parts of Work so processing will not be delayed because of the need to review submittals concurrently for coordination.
 - 1.3.2.3. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- 1.3.3. Comply with Contract Documents for list of submittals and time requirements for scheduled performance of Work.
- 1.3.4. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.
- 1.3.5. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- 1.3.6. Provide space for Contractor and Architect review stamps.

- 1.3.7. Revise and resubmit submittals as required, identify all changes made since previous submittal.
- 1.3.8. Distribute reviewed submittals via District PMIS to concerned parties. Instruct parties to promptly report any inability to comply with provisions.
- 1.3.9. Submittals not requested will not be recognized or processed. Submittals not requested will be returned without review.

1.4. SHOP DRAWINGS

- 1.4.1. Prepare Project-specific information, drawn accurately to scale. Do not reproduce Contract Documents or copy standard information as the basis of shop drawings. Standard information prepared without specific reference to the Project is not a shop drawing.
- 1.4.2. Do not use or allow others to use Shop Drawings which have been submitted and have been rejected.
- 1.4.3. Preparation: Fully illustrate requirements in Contract Documents. Include the following information, as applicable:
 - 1.4.3.1. Dimensions.
 - 1.4.3.2. Identification of products.
 - 1.4.3.3. Fabrication and installation drawings.
 - 1.4.3.4. Roughing-in and setting diagrams.
 - 1.4.3.5. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - 1.4.3.6. Shop work manufacturing instructions.
 - 1.4.3.7. Templates and patterns.
 - 1.4.3.8. Schedules.
 - 1.4.3.9. Design calculations.
 - 1.4.3.10. Compliance with specified standards.
 - 1.4.3.11. Notation of coordination requirements.
 - 1.4.3.12. Notation of dimensions established by field measurements.
 - 1.4.3.13. Relationship to adjoining construction clearly indicated.
 - 1.4.3.14. Seal and signature of professional engineer if specified.

1.4.3.15. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

1.4.3.16. All deviations from the Contract Documents, clearly indicated.

1.4.3.17. Copy of letter indicating acceptance of deviations indicated on the submittal.

1.4.4. Do not use Shop Drawings without an appropriate final stamp from the Contractor and District indicating action taken in connection with construction.

1.4.5. Deviations from Contract Documents require specific written acceptance by the District of the noted deviation and clear indication on the submittal.

1.5. ELECTRONIC SUBMITTAL PROCESS

1.5.1. Submittal Procedure for Large Format Shop Drawings.

1.5.1.1. Contractor shall submit Shop Drawings including uploading/posting an electronic transmittal (with a detailed description of the submittal including the subject, specification number and number of drawings) on PMIS (or another District pre-approved program).

1.5.1.2. Contractor shall verify that the Schedule of Submittals and all submittal log(s) on PMIS (or other District pre-approved program) are accurate and up to date.

1.5.1.3. The District and Architect will review and markup each Submittal and provide changes to Contractor for Contractor's incorporation into the Submittal.

1.5.1.4. This process will continue until the Contractor has provided a Submittal that is acceptable to the District and the Architect.

1.5.1.5. Once a Submittal is accepted, the District will provide a final accepted Submittal to the Contractor and the Contractor will closeout that one Submittal.

1.5.1.6. Contractor shall upload the completed record submittal to PMIS (or another District pre-approved program).

1.5.2. Product Data, Calculations and Small Format Drawings

1.5.2.1. Contractor shall upload/post one (1) electronic copy in Portable Document Format (.pdf) or Microsoft Excel (.xls, .xlsx), as requested (from manufacturer's website or pre-scanned) of the product literature, data, calculations, and/or small format shop drawings to PMIS (or another District pre-approved program) with a Transmittal (with a detailed description of the submittal) directly to the CM.

1.5.2.2. The District and Architect will review and markup each Submittal and provide changes to Contractor for Contractor's incorporation into the Submittal.

1.5.2.3. This process will continue until the Contractor has provided a Submittal that is

acceptable to the District and the Architect.

1.5.2.4. Once a Submittal is accepted, the District will provide a final accepted Submittal to the Contractor and the Contractor will closeout that one Submittal.

1.5.2.5. Contractor shall upload the completed record submittal for posting on PMIS (or another District pre-approved program).

1.5.3. Sample Submittal Procedure – (Product / Assembly Samples)

1.5.3.1. Contractor shall provide two (2) physical samples, one (1) sample mailed directly to the Architect, and one (1) sample directly to the CM on site, and Contractor will upload/post an electronic transmittal (with a detailed description of the submittal including the subject, specification number and number of drawings) on PMIS (or another District pre-approved program).

1.5.3.2. The District and Architect will review and markup each Submittal and provide changes to Contractor for Contractor's incorporation into the Submittal.

1.5.3.3. This process will continue until the Contractor has provided a Submittal that is acceptable to the District and the Architect.

1.5.3.4. Once a Submittal is accepted, the District will provide a final accepted Submittal to the Contractor and the Contractor will closeout that one Submittal.

1.5.3.5. Contractor shall upload s the completed record submittal for posting on PMIS (or another District pre-approved program).

1.6. PRODUCT DATA

1.6.1. In addition to the above requirements, mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

1.6.2. After review, distribute in accordance with the above provisions and provide Record Documents described in the Contract Documents.

1.7. SAMPLES

1.7.1. In addition to the above requirements, submit samples to illustrate functional and aesthetic characteristics of the Product in accordance with this Document, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1.7.2. Where specific colors or patterns are not indicated, provide materials and products specified in the full range of color, texture and pattern for selection by District. Range shall include standard stocked color/texture/pattern, standard color/texture/pattern not stocked, but available from manufacturer, and special color/ texture/pattern available from manufacturer as advertised in product data and brochures. Unless otherwise indicated in individual specification sections, District may select from any range at no additional cost to District.

- 1.7.3. Include identification on each sample, with full Project information.
- 1.7.4. Submit the number of samples that Contractor requires, plus one that will be retained by Architect and one by District.
- 1.7.5. Reviewed samples which may be used in the Work are indicated in individual specification Sections.

1.8. MANUFACTURERS' INSTRUCTIONS

- 1.8.1. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.
- 1.8.2. Identify conflicts between manufacturers' instructions and Contract Documents.

1.9. MANUFACTURERS' CERTIFICATES

- 1.9.1. When specified in individual specification Sections, submit manufacturers' certificates to Architect for review, in quantities specified for Product Data.
- 1.9.2. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.
- 1.9.3. Certificates may be recent or previous test results on material or Product and must be acceptable to District.

1.10. MOCK-UP

- 1.10.1. Where indicated, provide mock-ups as required. Mock-ups shall be prepared per the specifications and shall accurately and reasonably represent the quality of construction the Contractor will provide. If the mock-up or portions thereof do not adequately represent the quality of the work specified, the Contractor shall modify the mock-up as needed.
- 1.10.2. Once completed to the District's satisfaction, the mock-up shall serve as the standard of quality for the work.
- 1.10.3. All mock-ups, at District's option, shall remain the property of the District. If not required by the District, Contractor shall remove and dispose of the mock-up.
- 1.10.4. Where indicated, on-site mock-ups, if accepted, may be integrated into the Work.

1.11. ARCHITECT'S REVIEW OF SUBMITTALS

- 1.11.1. Submittals will be reviewed and stamped by the Architect "No exceptions taken," "Submit specified item" or "Make corrections noted" to indicate full or conditioned approval or "Revise and resubmit" or "Rejected" to indicate disapproval. Terms are defined as follows:

- 1.11.1.1. No Exceptions Taken: Accepted subject to its compatibility with future submittals and additional partial submittals for portions of the work not covered in this submittal. Does not constitute approval or deletion of specified or required items not shown in the partial submittal.
- 1.11.1.2. Submit specified item: Submit to the Architect the items indicated for review.
- 1.11.1.3. Correct as noted: Same as 1., except that minor corrections as noted shall be made by the Contractor. No resubmittal required.
- 1.11.1.4. Revise and resubmit: Rejected because of major inconsistencies or errors which shall be resolved or corrected by the Contractor prior to subsequent review by the Architect.
- 1.11.1.5. Rejected: Submitted material does not conform to plans and specifications in major respect. For example, wrong size, model, capacity or material. Resubmit.
- 1.11.1.6. Receipt Acknowledged. Received, recorded and distributed without further action.
- 1.11.2. Submittals reviewed by the Architect which have been stamped shall be deemed to have the following language affixed and made a part thereof, regardless of the initial or subsequent readability of the actual stamp.
 - 1.11.2.1. Corrections or comments made on submittals during this review do not relieve the contractor from compliance with the requirements of the drawings and specifications. This check is for review of general conformance with the design concept of the project and general compliance with information given in the Contract Documents. The contractor is responsible for confirming and correlating all quantities and dimensions, selection of fabrication processes and techniques of construction, coordinating the work of the trades; and performing the work in a safe and satisfactory manner.
- 1.11.3. Architect's review of submittals shall be completed within ten (10) business days of the date of submission. Any requests by the Architect for additional time shall not be unreasonably withheld.
- 1.11.4. Architect's review of submittals has, as a primary objective, to assist in the completion of the project on time and in conformance with the Contract requirements by permitting review of material and fabricated items prior to ordering. Architect's review of submittals is based only on the data presented and extends only to conformance with general design intent and information contained in the Contract Documents.
- 1.11.5. Architect's approval of submittals does not constitute final acceptance or unqualified approval of items or work proposed or put in place, nor does it constitute acceptance of responsibility for the accuracy, coordination or completeness of submittals. Architect's approval of submittals does not relieve the Contractor from the

responsibility for errors, omissions, or compliance with all the requirements of the Contract Documents.

1.11.6. Reimbursement of the Architect's costs for review:

1.11.6.1. Architect will record all time and expenses incurred to review submittals requiring more than two reviews.

1.11.6.2. Contractor shall reimburse the District through deduction from amounts due the Contractor upon receipt of the Architect's billing and that of the Architect's consultants at standard billing rates for all time and expenses incurred in unanticipated reviews.

1.11.7. Architect's review of submittals does not change the Contract in any manner.

1.12. **RESUBMITTAL**

1.12.1. Make all corrections or revisions required by reviewer's comments at Contractor's expense and resubmit as initially specified above. No additional costs will be authorized for corrections or revisions.

1.12.2. Product data and shop drawings:

1.12.2.1. Revise initial drawings or data and resubmit as initially specified.

1.12.2.2. Indicate changes which have been made other than those requested by reviewer.

1.12.3. Submit new samples as initially specified.

1.13. **DISTRIBUTION**

1.13.1. Distribute only submittals with Architect/Engineer (and DSA as applicable) stamps of review. Contractor is responsible for coordination of submittals and comments following review. Contractor to provide all additional reproduction costs for copies required by the Contractor at its expense. No additional costs will be authorized for Contractor costs pertaining to submittals.

1.14. **DEFERRED APPROVAL REQUIREMENTS**

1.14.1. Installation of deferred approval items shall not be started until detailed plans, specifications, and engineering calculations have been accepted and signed by the Architect or Engineer in general responsible charge of design and signed by a California registered Architect or professional engineer who has been delegated responsibility covering the work shown on a particular plan or specification and approved by the agency having authority (e.g., State Fire Marshall, Division of the State Architect, gas company, electrical utility company, water district, etc.). Deferred approval items for this Project are as indicated in the Summary of Work.

1.14.2. Unless otherwise indicated in the Contract Documents or if District provides written approval of a longer time period, Contractor shall submit all deferred approval items

for approval within thirty (30) calendar days of the notice to proceed with the Construction Phase.

- 1.14.3. Deferred approval drawings and specifications become part of the approved documents for the Project when they are submitted to and approved by DSA.
- 1.14.4. Submit material using electronic submittal process as defined above.
- 1.14.5. Identify and specify all supports, fasteners, spacing, penetrations, etc., for each of the deferred approval items, including calculations for each and all fasteners.
- 1.14.6. Submit documents to Architect for review prior to forwarding to DSA.
- 1.14.7. Documents shall bear the stamp and signature of the Structural, Mechanical, or Electrical Engineer licensed in the State of California who is responsible for the work shown on the documents.
- 1.14.8. Architect and its subconsultants will review the documents only for conformance with design concept shown on the documents. The Architect will then forward the Submittal to the agency having authority for approval.
- 1.14.9. Contractor shall respond to review comments made by DSA and revise and resubmit submittal to the Architect for re-submittal to DSA.
- 1.14.10. Contractor is notified that significant lead time is required for deferred approval review by DSA and shall schedule work accordingly. No extension of Contract Time will be allowed for delays incurred by deferred approval review. The Architect is not responsible for DSA delays in deferred approval review.

END OF DOCUMENT

DOCUMENT 01 40 00

QUALITY REQUIREMENTS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. Drawings;
- 1.1.5. 01 32 16 Construction Schedule – Network Analysis;
- 1.1.6. 01 42 16 General Definitions and References.

1.2. SUMMARY

- 1.2.1. This Document includes administrative and procedural requirements for quality assurance and quality control.
- 1.2.2. Testing and inspecting services by the District are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Documents' requirements.
 - 1.2.2.1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Specifications for those activities. Requirements in those Specifications may also cover production of standard products.
 - 1.2.2.2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Documents' requirements.
 - 1.2.2.3. Requirements for Contractor to provide quality-assurance and -control services required by District, District's consultants, or authorities having jurisdiction are not limited by provisions of this Document.

1.3. DEFINITIONS

- 1.3.1. 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.
- 1.3.2. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work

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

- 1.3.3. Mock-ups: Full-size, physical assemblies that are constructed on-site. Mock-ups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mock-ups establish the standard by which the Work will be judged.
- 1.3.4. Laboratory Mock-ups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.
- 1.3.5. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- 1.3.6. Product Testing: Tests and inspections that are performed by an NRTL (National Recognized Testing Laboratory), an NVLAP (National Voluntary Laboratory Accreditation Program), or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- 1.3.7. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- 1.3.8. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

1.4. CONFLICTING REQUIREMENTS

- 1.4.1. General: 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 uncertainties and requirements that are different but apparently equal, to District for a decision before proceeding.
- 1.4.2. 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 District for a decision before proceeding.

1.5. SUBMITTALS

- 1.5.1. Qualification Data: For testing agencies specified in "Quality Assurance" below to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- 1.5.2. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1.5.2.1. Specification number and title.

- 1.5.2.2. Description of test and inspection.
- 1.5.2.3. Identification of applicable standards, codes or regulations.
- 1.5.2.4. Identification of test and inspection methods.
- 1.5.2.5. Number of tests and inspections required.
- 1.5.2.6. Time schedule or time span for tests and inspections.
- 1.5.2.7. Entity responsible for performing tests and inspections.
- 1.5.2.8. Requirements for obtaining samples.
- 1.5.2.9. Unique characteristics of each quality-control service.
- 1.5.3. Reports: Prepare and submit certified written reports that include the following:
 - 1.5.3.1. Date of issue.
 - 1.5.3.2. Project title and number.
 - 1.5.3.3. Name, address, and telephone number of testing agency.
 - 1.5.3.4. Dates and locations of samples and tests or inspections.
 - 1.5.3.5. Names of individuals making tests and inspections.
 - 1.5.3.6. Description of the Work and test and inspection method.
 - 1.5.3.7. Identification of product and Specification.
 - 1.5.3.8. Complete test or inspection data.
 - 1.5.3.9. Test and inspection results and an interpretation of test results.
 - 1.5.3.10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 1.5.3.11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Documents' requirements.
 - 1.5.3.12. Name and signature of laboratory inspector.
 - 1.5.3.13. Recommendations on retesting and reinspecting.
 - 1.5.3.14. Descriptions of deficiencies noted, and corrective action undertaken to resolve such deficiencies.
 - 1.5.3.14.1. Deficiencies observed shall immediately be brought to the attention of the Contractor's field superintendent, and trade

foreman. In the event deficiencies are not corrected, or if an interpretation of the Contract Documents is required, the Testing Agency shall immediately notify the District and applicable consultant, Architect, or Engineer.

- 1.5.3.14.2. The Testing Agency shall maintain a deficiency list of all items not corrected and shall reinspect the area after the deficiency has been corrected. The list shall include a description of the deficiency, the date and time the deficiency was observed, who was notified, the date of reinspection and description of any corrective action taken. Distribute the deficiency list at least once per month.

- 1.5.3.15.15. At the end of the Project, the Testing Agency shall submit a final signed report stating whether the work tested and inspected conforms to the Contract Documents' requirements.

- 1.5.4. Permits, Licenses, and Certificates: For District'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.

1.6. QUALITY ASSURANCE

- 1.6.1. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specifications specify additional requirements.
- 1.6.2. 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. Where required by the individual Specifications, Installer employing workers trained and approved by manufacturer, Installer being acceptable to manufacturer, and/or Installer being an authorized representative of manufacturer for both installation and maintenance.
- 1.6.3. 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.
- 1.6.4. 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.
- 1.6.5. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of California, and who is experienced in providing engineering services of the kind indicated.
- 1.6.6. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

- 1.6.7. Specialists: Certain Specifications may require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1.6.7.1. Requirement for specialists shall not supersede building codes or regulations governing the Work.
- 1.6.8. Testing Agency Qualifications: An NRTL, an NVLAP, Division of the State of Architect's Accepted Laboratory, or an independent agency with the experience and capability to conduct testing and inspecting indicated; and with additional qualifications stated in individual Specifications; and where required by and acceptable to authorities having jurisdiction.
 - 1.6.8.1. NRTL: A Nationally Recognized Testing Laboratory according to 29 CFR 1910.7.
 - 1.6.8.2. NVLAP: A testing agency accredited according to NIST's (National Institute of Standards and Technology) National Voluntary Laboratory Accreditation Program.
 - 1.6.8.3. Tests shall be made by an accredited testing agency with a minimum of 5 years of experience in the specific type of testing to be performed. Except as otherwise provided, sampling and testing of all materials and the laboratory methods and testing equipment shall be in accordance with the applicable standards and methods of the California Building Standards code.
 - 1.6.8.4. For each type of inspection and testing service to be performed, the Testing Agency shall submit certification, signed and sealed by the Agency's professional engineer, of compliance with all applicable requirements of the following:
 - 1.6.8.4.1. ASTM E329, "Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction."
 - 1.6.8.4.2. "Recommended Requirements for Independent Laboratory Qualifications" published by the American Council of Independent Laboratories.
 - 1.6.8.5. Furnish written certification to the District that all equipment to be used has been calibrated in accordance with applicable ASTM standards within the last year and is in proper working order.
 - 1.6.8.6. Testing Agency Personnel Qualifications: Testing and inspection services shall be performed only by trained and experienced technicians currently qualified for the work they are to perform. Documentation of such training and experience shall be submitted to the District and/or its consultants upon request.
 - 1.6.8.7. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

- 1.6.8.8. 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.
- 1.6.9. Preconstruction Testing: Where a testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1.6.9.1. Contractor responsibilities include the following:
 - 1.6.9.1.1. Verify by its Quality Assurance/Quality Control procedures that an element is ready for testing prior to requesting a test.
 - 1.6.9.1.2. Provide test specimens representative of proposed products and construction.
 - 1.6.9.1.3. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - 1.6.9.1.4. Provide sizes and configurations of test assemblies, mock-ups, and laboratory mock-ups to adequately demonstrate capability of products to comply with performance requirements.
 - 1.6.9.1.5. Build site-assembled test assemblies and mock-ups using installers who will perform same tasks for Project.
 - 1.6.9.1.6. Build laboratory mock-ups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - 1.6.9.1.7. When testing is complete, remove test specimens, assemblies, mock-ups, and laboratory mock-ups; do not reuse products on Project.
 - 1.6.9.2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to District 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' requirements.
- 1.6.10. Mock-ups: Before installing portions of the Work requiring mock-ups, build mock-ups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1.6.10.1. Build mock-ups in location and of size indicated or, if not indicated, as directed by District or its consultant.
 - 1.6.10.2. Notify District and its consultants seven (7) calendar days in advance of dates and times when mock-ups will be constructed.

- 1.6.10.3. Demonstrate the proposed range of aesthetic effects and workmanship.
- 1.6.10.4. Obtain District and its consultant's approval of mock-ups before starting work, fabrication, or construction.
 - 1.6.10.4.1. Allow seven (7) calendar days for initial review and each re-review of each mock-up.
- 1.6.10.5. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.
- 1.6.10.6. Demolish and remove mock-ups when directed, unless otherwise indicated.
- 1.6.11. Laboratory Mock-Ups: Comply with requirements of preconstruction testing and those specified in individual Specifications in Divisions 02 through 49.

1.7. QUALITY CONTROL

- 1.7.1. District Responsibilities: Where quality-control services are indicated as District's responsibility, District will engage a qualified testing agency to perform these services.
 - 1.7.1.1. District will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting the testing agencies are engaged to perform.
 - 1.7.1.2. 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 Price will be adjusted by Change Order per the Contract Documents.
- 1.7.2. Tests and inspections not explicitly assigned to District are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 1.7.2.1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform the quality-control services.
 - 1.7.2.1.1. Contractor shall not employ same entity engaged by District, unless agreed to in writing by District.
 - 1.7.2.2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 1.7.2.3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 1.7.2.4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 1.7.2.5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

- 1.7.3. 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 Document "01 33 00 Submittal Procedures."
- 1.7.4. 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' requirements.
- 1.7.5. Testing Agency Responsibilities: Cooperate with District, District's consultants, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1.7.5.1. Notify District, District's consultants, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 1.7.5.2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 - 1.7.5.3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 - 1.7.5.4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - 1.7.5.5. Do not release, revoke, alter, or increase the Contract Documents' requirements or approve or accept any portion of the Work.
 - 1.7.5.6. Do not perform any duties of Contractor.
- 1.7.6. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify testing agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1.7.6.1. Access to the Work.
 - 1.7.6.2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 1.7.6.3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - 1.7.6.4. Facilities for storage and field curing of test samples.
 - 1.7.6.5. Delivery of samples to testing agencies.
 - 1.7.6.6. Preliminary design mix proposed for use for material mixes that require control by testing agency.

- 1.7.6.7. Security and protection for samples and for testing and inspecting equipment at Project Site.
- 1.7.6.8. Furnish tools, samples of materials, design mixes, equipment and assistance as requested.
- 1.7.6.9. Provide and maintain, for the sole use of the Testing Agency, adequate facilities for the safe storage and proper curing of concrete test cylinders on the project site for the first 24 hours after casting as required by ASTM C31, Method of Making and Curing Concrete Test Specimens in the Field.
- 1.7.6.10. Build and store masonry test prisms in a manner acceptable to the Testing Agency. Prisms to be tested shall remain at the job site until moved by Testing Agency personnel.
- 1.7.6.11. Notify Testing Agency at least 10 business days in advance of any qualification testing for welding required herein.
- 1.7.6.12. Notify Testing Agency at least 48 hours prior to expected time for operations requiring testing or inspection services.
- 1.7.6.13. Make arrangements with the Testing Agency and pay for additional samples and tests made for the Contractor's convenience or for retesting of failed samples.
- 1.7.6.14. For deficiencies requiring corrective action, submit in writing a description of the deficiency and a proposed correction to the District. After review and approval, the proposed corrective action shall be implemented and inspected by the Testing Agency. It is Contractor's responsibility to ascertain that the deficiency is corrected and inspected prior to the work being covered.
- 1.7.6.15. Retention of an independent Testing Agency by the District shall in no way relieve Contractor of responsibility for performing all work in accordance with the Contract Documents' requirements.
- 1.7.7. 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.
 - 1.7.7.1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.8. TESTS AND SPECIAL INSPECTIONS

- 1.8.1. Tests and Special Inspections: District will engage a qualified testing agency to conduct tests and special inspections required by authorities having jurisdiction as follows:
 - 1.8.1.1. Soils: 2022 CBC 1705A.6
 - 1.8.1.2. Cast in Place Concrete: 2022 CBC 1705A.3
 - 1.8.1.3. Post Installed Anchors: 2022 CBC 1705A.3.8 and Manufacturer's ICC-ES Report
 - 1.8.1.4. Structural Steel: 2022 CBC 1705A.2.1 and AISC 341-05
 - 1.8.1.5. Miscellaneous Steel: 2022 CBC 1705.A.2 and AISC 341-05

- 1.8.2. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specifications, and as follows:
 - 1.8.2.1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 - 1.8.2.2. Notifying District, District's consultants, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 1.8.2.3. Submitting a certified written report of each test, inspection, and similar quality-control service to District, with copy to Contractor and to authorities having jurisdiction.
 - 1.8.2.4. Submitting a final report of special tests and inspections at Project Completion, which includes a list of unresolved deficiencies.
 - 1.8.2.5. Interpreting tests and inspections and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
 - 1.8.2.6. Retesting and reinspecting corrected work.

2. PRODUCTS

2.1. GENERAL

- 2.1.1. Do not use any materials or equipment represented by samples until tests, if required, have been made and the materials or equipment found to be acceptable. Any product which becomes unfit for use after acceptance shall not be incorporated into the Work.

3. EXECUTION

3.1. TEST AND INSPECTION LOG

- 3.1.1. Prepare a record of tests and inspections. Include the following:
 - 3.1.1.1. Date test or inspection was conducted.
 - 3.1.1.2. Description of the Work tested and inspected.
 - 3.1.1.3. Date test or inspection results were transmitted to District.
 - 3.1.1.4. Identification of testing agency or special inspector conducting test or inspection.
- 3.1.2. Maintain log at Project Site. Post changes and modifications as they occur. Provide access to test and inspection log for District's reference during normal working hours.

3.2. REPAIR AND PROTECTION

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

- 3.2.1.1. Provide materials and comply with installation requirements specified in other Specifications. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
- 3.2.1.2. Comply with Document "01 73 10 Cutting and Patching" and all related Contract Documents' requirements.
- 3.2.2. Protect construction exposed by or for quality-control service activities.
- 3.2.3. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF DOCUMENT

DOCUMENT 01 42 13

ABBREVIATIONS AND ACRONYMS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions including without limitation, Contract Terms and Definitions; and
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any).

1.2. ABBREVIATIONS AND ACRONYMS FOR STANDARDS AND REGULATIONS

- 1.2.1. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations as indicated in Thomson Gale™ (www.gale.com), Gale Research's "Encyclopedia of Associations" or "Encyclopedia of Associations: National Organizations of the U.S.," or in Columbia Books' "National Trade & Professional Associations of the U.S."
- 1.2.2. Some of the applicable abbreviations and acronyms referenced in the Specifications or other Contract Documents have the following meanings, subject to updates or revisions based on the above-referenced publications:
 - AA: Aluminum Association
 - AAMA: Architectural Aluminum Manufacturers Association
 - AASHTO: American Association of State Highway and Transportation Officials
 - ABPA: Acoustical and Board Products Association
 - ACI: American Concrete Institute
 - AGA: American Gas Association
 - AGC: Associated General Contractors
 - AHC: Architectural Hardware Consultant
 - AI: Asphalt Institute
 - AIA: American Institute of Architects
 - AIEE: American Institute of Electrical Engineers
 - AISC: American Institute of Steel Construction
 - AISI: American Iron and Steel Institute
 - AMCA: Air Moving and Conditioning Association
 - ANSI: American National Standards Institute
 - APA: American Plywood Association
 - ARI: Air Conditioning and Refrigeration Institute
 - ASHRAE: American Society of Heating, Refrigeration and Air Conditioning Engineers
 - ASME: American Society of Mechanical Engineers

- ASSE: American Society of Structural Engineers
- ASTM: American Society of Testing and Materials
- AWPB: American Wood Preservers Bureau
- AWPI: American Wood preservers Institute
- AWS: American Welding Society
- AWSC: American Welding Society Code
- AWI: Architectural Woodwork Institute
- AWWA: American Water Works Association
- BIA: Brick Institute of America
- CCR: California Code of Regulations
- CLFMI: Chain Link Fence Manufacturers Institute
- CMG: California Masonry Guild
- CRA: California Redwood Association
- CRSI: Concrete Reinforcing Steel Institute
- CS: Commercial Standards
- CSI: Construction Specifications Institute
- CTI: Cooling Tower Institute
- FGMA: Flat Glass Manufacturer's Association
- FIA: Factory Insurance Association
- FM: Factory Mutual
- FS: Federal Specification
- FTI: Facing Title Institute
- GA: Gypsum Association
- ICC: International Code Council
- IEEE: Institute of Electrical and Electronic Engineers
- IES: Illumination Engineering Society
- LIA: Lead Industries Association
- MIA: Marble Institute of America
- MLMA: Metal Lath Manufacturers Association
- MS: Military Specifications
- NAAMM: National Association of Architectural Metal Manufacturers
- NBHA: National Builders Hardware Association
- NBFU: National Board of Fire Underwriters
- NBS: National Bureau of Standards
- NCMA: National Concrete Masonry Association
- NEC: National Electrical Code
- NEMA: National Electrical Manufacturers Association
- NFPA: National Fire Protection Association/National Forest Products Association
- NMWIA: National Mineral Wool Insulation Association
- NTMA: National Terrazzo and Mosaic Association
- NWMA: National Woodwork Manufacturer's Association
- ORS: Office of Regulatory Services (California)
- OSHA: Occupational Safety and Health Act
- PCI: Precast Concrete Institute
- PCA: Portland Cement Association
- PDCA: Painting and Decorating Contractors of America
- PDI: Plumbing Drainage Institute
- PEI: Porcelain Enamel Institute
- PG&E: Pacific Gas & Electric Company

- PS: Product Standards
- SDI: Steel Door Institute; Steel Deck Institute
- SJI: Steel Joist Institute
- SSPC: Steel Structures Painting Council
- TCA: Tile Council of America
- TPI: Truss Plate Institute
- UBC: Uniform Building Code
- UL: Underwriters Laboratories Code
- UMC: Uniform Mechanical Code
- USDA: United States Department of Agriculture
- VI: Vermiculite Institute
- WCLA: West Coast Lumberman's Association
- WCLB: West Coast Lumber Bureau
- WEUSER: Western Electric Utilities Service Engineering Requirements
- WIC: Woodwork Institute of California
- WPOA: Western Plumbing Officials Association

- 1.2.3. Additional Abbreviations and Symbols: Refer to the above-referenced publications or to Drawings for additional abbreviations and for symbols.

END OF DOCUMENT

DOCUMENT 01 42 16

GENERAL DEFINITIONS AND REFERENCES

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISION

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions including without limitation, Contract Terms and Definitions;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any); and

1.2. DEFINITIONS

General: Basic Contract definitions are included in the General Conditions of the Contract for Construction. The following are in addition to those definitions.

- 1.2.1. "Alternate": A cost or credit for certain Work that may be added to or deducted from the Project.
- 1.2.2. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- 1.2.3. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- 1.2.4. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- 1.2.5. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- 1.2.6. "Provide": Furnish and install, complete and ready for the intended use.

1.3. QUALITY ASSURANCE

- 1.3.1. For products or workmanship specified by association, trade, or Federal Standards, Contractor shall comply with requirements of the standard, except when more stringent requirements are specified in the Contract Documents, or are required by applicable codes.
- 1.3.2. Contractor shall conform to current reference standard publication in effect on the date of bid opening.

- 1.3.3. Unless directed otherwise by the Contract Documents, Contractor shall obtain copies of referenced standards.
- 1.3.4. Unless directed otherwise by the Contract Documents, Contractor shall maintain a copy of referenced standards at jobsite until Completion.
- 1.3.5. If specified standards conflict with Contract Documents, Contractor shall request clarification from the District or the Architect before proceeding.
- 1.3.6. Governing Codes shall be as shown in the Contract Documents including, without limitation, the Specifications.

1.4. STANDARDS

- 1.4.1. Standard Specifications: References to codes, specifications and standards referred to in the Contract Documents shall mean, and are intended to be, the latest edition, amendment or revision of such reference standard in effect as of the date of these Contract Documents. If those standard specifications are revised prior to Completion of any part of the Work to which such revision would pertain, Contractor may, if acceptable to and approved by the District, perform such Work in accordance with the revised standard specifications.
- 1.4.2. Conflicting Requirements: Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different, but apparently equal, and uncertainties to the District for a decision before proceeding.
- 1.4.3. 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 the requirements. Refer uncertainties to District for a decision before proceeding.
- 1.4.4. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
- 1.4.5. Copies from the Publication Source: Where copies of standards are needed for performance of a required construction activity, Contractor shall obtain copies directly from the publication source.

1.5. SCHEDULE OF REFERENCES

The following information is intended only for the general assistance of Contractor. District does not represent the accuracy of the information. Contractor shall independently verify the information for each entity listed below:

AA	Aluminum Association 900 19th Street NW, Suite 300 Washington, DC 20006	202/862-5100
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	www.aluminum.org	
AABC	Associated Air Balance Council 1518 K Street, NW, Suite 503 Washington, DC 20005 www.aabchg.com	202/737-0202
AAMA	American Architectural Manufacturers Association 1827 Walden Office Sq., Suite 104 Schaumburg, IL 60173-4268 www.aamanet.org	847/303-5664
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, Suite 249 Washington, DC 20001 www.aashto.org	202/624-5800
AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215 One Davis Drive Research Triangle Park, NC 27709-2215 www.aatcc.org	919/549-8141
ACI	American Concrete Institute P.O. Box 9094 Farmington Hills, MI 48333-9094 www.aci-int.org	248/848-3700
ACPA	American Concrete Pipe Association 222 West Las Colinas Blvd., Suite 641 Irving, TX 75039-5423 www.concrete-pipe.org	972/506-7216
ADC	Air Diffusion Council 11 South LaSalle St., Suite 1400 Chicago, IL 60603 http://www.flexibleduct.org/index.asp	312/201-0101
AFPA	American Forest and Paper Association 1111 19th St., NW, Suite 800 Washington, DC 20036 http://www.afandpa.org/	202/463-2700
AGA	American Gas Association 1515 Wilson Blvd. Arlington VA 22209 www.aga.com	703/841-8400
AHA	American Hardboard Association 1210 W. Northwest Hwy	847/934-8800

Palatine, IL 60067-1897
<http://domensino.com/AHA/default.htm>

AI	Asphalt Institute Research Park Drive P.O. Box 14052 Lexington, KY 40512-4052 www.asphaltinstitute.org	606/288-4960
AIA	The American Institute of Architects 1735 New York Avenue, NW Washington, DC 20006-5292 www.aia.org	202/626-7300
AISC	American Institute of Steel Construction One East Wacker Drive, Suite 3100 Chicago, IL 60601-2001 http://www.aisc.org/	800/644-2400
AITC	American Institute of Timber Construction 7012 S. Revere Pkwy., Suite 140 Englewood, CO 80112 www.aitc-glulam.org	303/792-9559
ALCA	Associated Landscape Contractors of America 12200 Sunrise Valley Drive, Suite 150 Reston, VA 20191 www.alca.org	703/620-6363
ALI	Associated Laboratories, Inc. P.O. Box 152837 1323 Wall St. Dallas, TX 75315 http://www.assoc-labs.com/	214/565-0593
ALSC	American Lumber Standards Committee P.O. Box 210 Germantown, MD 20875	301/972-1700
AMCA	Air Movement and Control Association International, Inc. 30 W. University Drive Arlington Heights, IL 60004-1893 www.amca.org	847/394-0150
ANLA	American Nursery and Landscape Association 1250 Eye Street, NW, Suite 500 Washington, DC 20005	202/789-2900
ANSI	American National Standards Institute 11 West 42nd Street, 13th Floor New York, NY 10036-8002	212/642-4900

www.ansi.org

APA	APA-The Engineered Wood Association P.O. Box 11700 Tacoma, WA 98411-0700 www.apawood.org	206/565-6600
APA	Architectural Precast Association P.O. Box 08669 Fort Myers, FL 33908-0669	941/454-6989
ARI	Air Conditioning and Refrigeration Institute 4301 Fairfax Drive, Suite 425 Arlington, VA 22203 www.ari.org	703/524-8800
ARMA	Asphalt Roofing Manufacturers Association Center Park 4041 Powder Mill Road, Suite 404 Calverton, MD 20705	301/231-9050
ASA	Acoustical Society of America 500 Sunnyside Blvd. Woodbury, NY 11797	516/576-2360
ASCE	American Society of Civil Engineers- World Headquarters 1801 Alexander Bell Drive Reston, VA 20190-4400 www.asce.org	800/548-2723 703/295-6000
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329-2305 www.ashrae.org	800/527-4723 404/636-8400
ASLA	American Society of Landscape Architects 4401 Connecticut Ave., NW, 5th Floor Washington, DC 20008-2369 www.asla.org	202/686-2752
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017-2392 www.asme.org	800/434-2763
ASPE	American Society of Plumbing Engineers 3617 Thousand Oaks Blvd., Suite 210 Westlake, CA 91362-3649	805/495-7120
ASQC	American Society for Quality Control	800/248-1946

	611 E. Wisconsin Avenue Milwaukee, WI 53201-3005 www.asqc.org	414/272-8575
ASSE	American Society of Sanitary Engineering 28901 Clemens Road Westlake, OH 44145 www.asse-plumbing.org	216/835-3040
ASTM	American Society for Testing and Materials 100 Barr Harbor Drive West Conshohocken, PA 19428-2959 www.astm.org	610/832-9500
AWCI	Association of the Wall and Ceiling Industries--International 307 E. Annandale Road, Suite 200 Falls Church, VA 22042-2433 www.awci.org	703/534-8300
AWPA	American Wood-Preservers' Association 3246 Fall Creek Highway, Suite 1900 Granbury, TX 76049-7979	817/326-6300
AWS	American Welding Society 550 NW LeJeune Road Miami, FL 33126 www.amweld.org	800/443-9373 305/443-9353
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235 www.awwa.org	800/926-7337 303/794-7711
BHMA	Builders' Hardware Manufacturers Association 355 Lexington Avenue, 17th Floor New York, NY 10017-6603	212/661-4261
CBM	Certified Ballast Manufacturers Association 1422 Euclid Avenue, Suite 402 Cleveland, OH 44115-2094	216/241-0711
CGA	Compressed Gas Association 1725 Jefferson Davis Hwy, Suite 1004 Arlington, VA 22202-4102 www.cganet.com	703/412-0900
CISCA	Ceilings & Interior Systems Construction Association 1500 Lincoln Hwy, Suite 202 St. Charles, IL 60174 www.cisca.org	630/584-1919

CISPI	Cast Iron Soil Pipe Institute 5959 Shallowford Road, Suite 419 Chattanooga, TN 37421	423/892-0137
CPSC	Consumer Product Safety Commission East West Towers 4330 East-West Hwy. Bethesda, MD 20814	800/638-2772
CPPA	Corrugated Polyethylene Pipe Association 432 N. Superior Street Toledo, OH 43604	800/510-2772 419/241-2221
CRA	California Redwood Association 405 Enfrente Drive, Suite 200 Novato, CA 94949	415/382-0662
CRI	Carpet and Rug Institute 310 S. Holiday Avenue Dalton, GA 30722-2048 www.carpet-rug.com	800/882-8846 706/278-3176
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road Schaumburg, IL 60173-4758 www.crsi.org	847/517-1200
CTI	Ceramic Tile Institute of America 12061 W. Jefferson Blvd. Culver City, CA 90230-6219	310/574-7800
DHI	Door and Hardware Institute 14170 Newbrook Drive Chantilly, VA 20151-2223 www.dhi.org	703/222-2010
DIPRA	Ductile Iron Pipe Research Association 245 Riverchase Pkwy East, Suite O Birmingham, AL 35244	205/988-9870
DOC	Department of Commerce 14th Street and Constitution Avenue, NW Washington, DC 20230	202/482-2000
DOT	Department of Transportation 400 Seventh Street, SW Washington, DC 20590	202/366-4000
EJMA	Expansion Joint Manufacturers Association 25 N. Broadway Tarrytown, NY 10591-3201	914/332-0040

EPA	Environmental Protection Agency 401 M Street, SW Washington, DC 20460	202/260-2090
FCICA	Floor Covering Installation Contractors Association P.O. Box 948 Dalton, GA 30722-0948	706/226-5488
FM	Factory Mutual 1151 Boston-Providence Turnpike P.O. Box 9102 Norwood, MA 02062-9102 www.factorymutual.com	781/255-4300
FS	Federal Specifications Unit (Available from GSA) 470 East L'Enfant Plaza, SW, Suite 8100 Washington, DC 20407	202/619-8925
GA	Gypsum Association 810 First Street NE, Suite 510 Washington, DC 20002 www.usg.com	202/289-5440
GANA	Glass Association of North America 3310 SW Harrison Street Topeka, KS 66611-2279 www.glasswebsite.com/gana	913/266-7013
HMA	Hardwood Manufacturers Association 400 Penn Center Blvd., Suite 530 Pittsburgh, PA 15235-5605 www.hardwood.org	412/828-0770
HPVA	Hardwood Plywood and Veneer Association 1825 Michael Farraday Drive P.O. Box 2789 Reston, VA 22195-0789 www.hpva.org	703/435-2900
IEEE	Institute of Electrical and Electronic Engineers 345 E. 47th Street New York, NY 10017-2394 www.ieee.org	800/678-4333 212/705-7900
IESNA	Illuminating Engineering Society of North America 120 Wall Street, 17th Floor New York, NY 10005-4001 www.iesna.org	212/248-5000

ITS	Intertek Testing Services P.O. Box 2040 607/753-6711 3933 US Route 11 Cortland, NY 13045-7902 www.itsglobal.com	800/345-3851
LMA	Laminating Materials Association 116 Lawrence Street Hillsdale, NJ 07642-2730 www.lma.org	201/664-2700
MCAA	Mechanical Contractors Association of America 1385 Piccard Drive Rockville, MD 20850-4329	301/869-5800
ML/SFA	Metal Lath/Steel Framing Association (A Division of the NAAMM) 8 South Michigan Avenue, Suite 1000 Chicago, IL 60603	312/456-5590
MSS	Manufacturers Standardization Society for the Valve and Fittings Industry 127 Park Street, NE Vienna, VA 22180-4602	703/281-6613
NAA	National Arborist Association P.O. Box 1094 603/673-3311 Amherst, NH 03031-1094 www.natlarb.com	800/733-2622
NAAMM	National Association of Architectural Metal Manufacturers 8 South Michigan Avenue, Suite 1000 Chicago, IL 60603 www.gss.net/naamm	312/782-5590
NAIMA	North American Insulation Manufacturers Association 44 Canal Center Plaza, Suite 310 Alexandria, VA 22314 www.naima.org	703/684-0084
NAPA	National Asphalt Pavement Association NAPA Building 5100 Forbes Blvd. Lanham, MD 20706-4413	301/731-4748
NCSPA	National Corrugated Steel Pipe Association 1255 23rd Street, NW, Suite 850 Washington, DC 20037 www.ncspa.org	202/452-1700

NEBB	National Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877-4121	301/977-3698
NECA	National Electrical Contractors Association 3 Bethesda Metro Center, Suite 1100 Bethesda, MD 20814-5372	301/657-3110
NEI	National Elevator Industry 185 Bridge Plaza North, Suite 310 Fort Lee, NJ 07024	201/944-3211
NEMA	National Electrical Manufacturers' Association 1300 N. 17th Street, Suite 1847 Rosslyn, VA 22209 www.nema.org	703/841-3200
NFPA	National Fire Protection Association One Batterymarch Park P.O. Box 9101 Quincy, MA 02269-9101 www.nfpa.org	800/344-3555 617/770-3000
NHLA	National Hardwood Lumber Association P.O. Box 34518 Memphis, TN 38184-0518 www.natlhardwood.org	901/377-1818
NIA	National Insulation Association 99 Canal Center Plaza, Suite 222 Alexandria, VA 22314 www.insulation.org	703/683-6422
NPA	National Particleboard Association 18928 Premiere Court Gaithersburg, MD 20879-1569 www.pbmdf.com	301/670-0604
NPCA	National Paint and Coatings Association 1500 Rhode Island Avenue, NW Washington, DC 20005-5597 www.paint.org	202/462-6272
NRCA	National Roofing Contractors Association O'Hare International Center 10255 W. Higgins Road, Suite 600 Rosemont, IL 60018-5607 www.roofonline.org	800/323-9545
NRMCA	National Ready Mixed Concrete Association 900 Spring Street Silver Spring, MD 20910	301/587-1400

www.nrmca.org

NSF	NSF International P.O. Box 130140 Ann Arbor, MI 48113-0140 www.nsf.org	313/769-8010
NUSIG	National Uniform Seismic Installation Guidelines 12 Lahoma Court Alamo, CA 94526	510/946-0135
NWWDA	National Wood Window and Door Association 1400 E. Touhy Avenue, G-54 Des Plaines, IL 60018 www.nwwda.org	800/223-2301 847/299-5200
SHA	Occupational Safety and Health Administration (U.S. Department of Labor) 200 Constitution Ave., NW Washington, DC 20210	202/219-8148
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077-1083 www.portcement.org	847/966-6200
PDCA	Painting and Decorating Contractors of America 3913 Old Lee Hwy, Suite 33-B Fairfax, VA 22030 www.pdca.com	800/332-7322 703/359-0826
PDI	Plumbing and Drainage Institute 45 Bristol Drive, Suite 101 South Easton, MA 02375	800/589-8956 508/230-3516
RFCI	Resilient Floor Covering Institute 966 Hungerford Drive, Suite 12-B Rockville, MD 20805-1714	301/340-8580
RIS	Redwood Inspection Service c/o California Redwood Association 405 Enfrente Drive, Suite 200 Novato, CA 94949-7206	415/382-0662
SDI	Steel Deck Institute P.O. Box 25 Fox River Grove, IL 60012 www.sdi.org	847/462-1930
SDI	Steel Door Institute 30200 Detroit Road	216/889-0010

	Cleveland, OH 44145-1967	
SMA	Stucco Manufacturers Association 14006 Ventura Blvd. Sherman Oaks, CA 91403	213/789-8733
SMACNA	Sheet Metal and Airconditioning Contractors National Association, Inc. P.O. Box 221230 Chantilly, VA 20151-1209 www.smacna.org	703/803-2980
SPI	Society of the Plastics Industry, Inc. Spray Polyurethane Division 1801 K Street, NW, Suite 600K Washington, DC 20006 www.socplas.org	800/951-2001 202/974-5200
SSPC	Steel Structures Painting Council 40 24th Street, 6th Floor Pittsburgh, PA 15222-4643	412/281-2331
TCA	Tile Council of America 100 Clemson Research Blvd. Anderson, SC 29625	864/646-8453
TPI	Turfgrass Producers International 1855-A Hicks Road Rolling Meadows, IL 60008	800/405-8873 847/705-9898
UL	Underwriters Laboratories, Inc. 333 Pfingston Road 847/272-8800 Northbrook, IL 60062 www.ul.com	800/704-4050
UNI	Uni-Bell PVC Pipe Association 2655 Villa Creek Drive, Suite 155 Dallas, TX 75234 www.members.aol.com/unibell1	972/243-3902
USDA	U.S. Department of Agriculture 14th St. and Independence Ave., SW Washington, DC 20250	202/720-8732
WA	Wallcoverings Association 401 N. Michigan Avenue Chicago, IL 60611-4267	312/644-6610
WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281-3145	503/639-0651

WCMA	Window Covering Manufacturers Association 355 Lexington Ave., 17th Floor New York, NY 10017-6603	212/661-4261
WIC	Woodwork Institute of California P.O. Box 980247 West Sacramento, CA 95798-0247	916/372-9943
WLPDIA	Western Lath/Plaster/Drywall Industries Association 8635 Navajo Road San Diego, CA 92119	619/466-9070
WMMPA	Wood Moulding & Millwork Producers Association 507 First Street Woodland, CA 95695 www.wmmpa.com	800/550-7889 916/661-9591
WRI	Wire Reinforcement Institute 203 Loudoun Street, SW Leesburg, VA 20175-2718	703/779-2339
WWPA	Western Wood Products Association Yeon Building 522 S.W. 5th Avenue Portland, OR 97204-2122	503/224-3930

END OF DOCUMENT

SECTION 01 45 23 TESTING AND INSPECTING SERVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements and qualifications including but not limited to:
 - 1. Professional testing and laboratory services.
 - 2. Accessories necessary for the completion of testing and laboratory services.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements:
 - 1. Specific quality assurance and quality 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.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and quality control procedures that facilitate compliance with Contract Document requirements.
 - 3. Requirements for Contractor to provide quality assurance and quality control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions.
 - 4. Specific test and inspection requirements are not specified in this Section.
- C. A Qualified Independent Testing Laboratory and/or Geotechnical Engineering Service Selected and Paid by Owner:
 - 1. Owner will pay for the initial laboratory services of materials that comply with the requirements of the Contract Documents. Contractor shall pay for testing and retesting of materials that do not comply with the requirements of the Contract Documents.
- D. Inspecting agency shall perform inspections and tests in accordance with the rules and regulations of the building code, local authorities, specifications of ASTM, and the Contract Documents.
- E. Materials and workmanship found not in compliance with required standards or performance obligations shall be removed and replaced. Replacement and subsequent testing shall be at Contractor's expense.
- F. Where terms "Inspector" and "Laboratory" are used, it is meant and in reference to an officially designated and accredited inspector of the testing laboratory or geotechnical service engaged by Owner.
- G. The District shall employ or contract with a Project Inspector who shall be approved by DSA for the classification required by the scope of the project. The Project Inspector shall execute all responsibilities in accordance with the requirements set forth in the CAC and DSA IR A-8: Project Inspector and Assistant Inspector Duties and Performance.
- H. Laboratory inspections shall not relieve Contractor or fabricator of his responsibility to

furnish materials and workmanship in accordance with the Contract Documents.

- I. Contractor or fabricator shall cooperate with the testing laboratory in matters pertaining to the Work.
- J. Contractor to address deficiency and failed reports.

1.3 SUBMITTALS

- A. Schedule of Tests and Inspections:
 - 1. Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses:
 - a. Prepare in tabular form and include the following:
 - 1) Specification Section number and title.
 - 2) Entity responsible for performing test and inspection.
 - 3) Description of test and inspection.
 - 4) Identification of applicable standards.
 - 5) Identification of test and inspection methods.
 - 6) Number of tests and inspections required.
 - 7) Time schedule or time span for tests and inspections.
 - 8) Requirements for obtaining samples.
 - 9) Unique characteristics of each quality control service.
- B. Test and Inspection Reports:
 - 1. Prepare and submit certified written reports specified. Include the following:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making tests and inspections.
 - f. Description of the Work and test and inspection method.
 - g. Identification of product and Specification Section.
 - h. Complete test or inspection data.
 - i. Test and inspection results and an interpretation of test results.
 - j. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - k. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - l. Name and signature of laboratory inspector.
 - m. Recommendations on retesting and re-inspecting.
- C. Submit copies of reports of each inspection and test:
 - 1. Owner, program or project manager, Architect, and each engineer or outside consultants regarding their particular phase of the Project: One (1) copy each.
 - 2. Construction Manager (CM) and Contractor: Two (2) copies each.
- D. In addition to furnishing a written report, notify the CM and Contractor verbally of uncorrected conditions or failures to comply with requirements of the Contract Documents, and immediately fax and email corresponding report to Architect and the engineer.
- E. At completion of each trade or branch of Work requiring inspecting and testing, submit a final certificate attesting to satisfactory completion of Work.

- F. Report full compliance with requirements of the Contract Documents.
- G. Submit copies of test results sealed by a registered engineer to municipal authorities having jurisdiction, as required.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. The 2022 California Administrative Code (Title 24, Part 2, Volume 2) describes the general administrative requirements for the Project under the jurisdiction of the Division of the State Architect (DSA). Included is a list of inspections coordinated with CBC Section listings. These provisions require that a structural test for construction projects under DSA jurisdiction be performed by testing laboratories acceptable to DSA. DSA administers the Laboratory Evaluation and Acceptance Program to evaluate laboratories for structural testing and special inspection services. A NRTL, a NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, documented according to ASTM E329 and ASTM E534, and with additional qualifications specified in individual Sections:
 - a. NRTL: A Nationally Recognized Testing Laboratory according to 29 CFR 1910.7.
 - b. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
 - c. Laboratory Evaluation and Acceptance program to evaluate laboratories acceptable to DSA.
 - d. Testing agencies shall be insured against errors and omissions by a professional liability insurance policy having a minimum limit of liability of \$500,000.00.
- B. Inspection and testing services for the testing agency shall be under the direction of a California Registered Engineer, charged with engineering managerial responsibility, and having a minimum of five (5) years' engineering experience in inspection and testing of construction materials.
- C. Concrete Inspectors: Inspecting personnel monitoring concrete work shall be ACI certified inspectors.
- D. Structural Steel:
 - 1. Primary inspectors performing structural steel inspection shall be currently certified AWS Certified Welding Inspectors (CWI), in accordance with the provisions of AWS QCI, *Standard and Guide for Qualification and Certification of Welding Inspectors*:
 - a. Inspector may be supported by assistant inspectors who perform specific inspection functions under the direct supervision of the primary inspector. Assistant inspectors shall be currently certified AWS Certified Associate Welding Inspectors (CAWI). Work of assistant inspectors shall be monitored daily by the inspector.
- E. Testing Equipment: Equipment shall be calibrated at intervals not exceeding 12 months by devices of accuracy traceable to the National Bureau of Standards.
- F. Referenced Standards: Latest adopted edition of standards referenced apply to the Work. In the event of conflict between the Contract Documents and referenced standards, the Contract Documents shall govern. In case of conflict between Contract Documents and the California Building Code, the more stringent shall govern.
- G. Owner Responsibilities:
 - 1. Where quality control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform the services:

- a. 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.
- b. Costs for retesting and re-inspecting 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.

H. Contractor Responsibilities:

- 1. 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:
 - a. Refer to individual Specification Sections for specific requirements.
 - b. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - c. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform the quality control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - d. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - e. Where quality control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality control service.
 - f. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - g. Submit additional copies of each written report directly to authorities having jurisdiction when they so direct.
 - h. Associated responsibilities and 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:
 - 1) Provide the following:
 - a) Provide access to the Work.
 - b) Deliver of samples to testing laboratory, without cost to Owner, in adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - c) Advise laboratory and Architect sufficiently in advance of construction operations to allow laboratory to complete required inspections or tests and to assign personnel for field inspection and testing as specified.
 - d) Provide facilities for storage and curing of concrete test samples on site for the first 24 hours and for subsequent field curing required by ASTM C31.
 - e) Incidental labor, facilities, and equipment necessary to assist laboratory personnel in obtaining and handling samples at the site.
 - f) Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - g) Provide concrete mix designs in accordance with ACI 301 made by an independent testing laboratory or qualified concrete supplier. Where mix designs by an independent testing laboratory are required, select and pay for laboratory.
 - h) Obtain required inspections or approvals of the building official. Inspection requests and notifications required by building code are responsibility of Contractor.
 - i) Provide current welder certificates for each welder employed.
 - j) Provide fabrication and erection inspection and testing of welds in accordance with AWS D1.1, Chapter 6.

- k) Use prequalification of welding procedures in executing the Work.
 - l) Security and protection for samples and for testing and inspecting equipment at the Project site.
 - i. Retesting/re-inspecting: Regardless of payment responsibility of the original tests or inspections, provide quality control services, including retesting and re-inspecting, for construction that replaced Work failing to comply with the Contract Documents, code requirements, or what is required from DSA.
- I. Testing Agency Responsibilities:
 - 1. Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections:
 - a. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - b. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 - c. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
 - d. Submit a certified written report, in duplicate, of each test, inspection, and similar quality control service through Contractor.
 - e. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - f. Do not perform any duties of Contractor.
- J. Authority and Duties of Laboratory Personnel:
 - 1. A representative of the testing laboratory, who has reviewed and is familiar with the Project and Specifications, shall participate in pre-construction conferences. The representative shall coordinate material testing and inspection requirements with Contractor and its subcontractors consistent with the planned construction schedule. The laboratory representative shall attend conferences required or requested to address quality control issues.
 - 2. Laboratory personnel shall inspect and test materials, assemblies, specimens, and Work performed, including design mixes, methods and techniques, and report the progress to Architect.
 - 3. If material or Work fails to meet requirements of the Contract Documents, the laboratory inspector shall notify the CM, Architect, engineers, supplier, or Subcontractor providing or preparing the materials or Work being tested of such failure.
 - 4. Laboratory personnel shall not perform the work of Contractor or act as foremen or superintendents. Work will be inspected as it progresses, but failure to detect defective Work or materials shall not prevent later rejection when a defect is discovered.
 - 5. Laboratory personnel are not authorized to revoke, alter, relax, enlarge, or release the requirements of the Contract Documents or approve or accept portions of Work, except where approval is specifically specified in the Specifications.
 - 6. Comply with building code requirements for special inspections.
- K. Testing Laboratory Guidelines and Procedures:
 - 1. Technicians scheduled to perform specific testing services must be qualified to review and perform other services that overlap, i.e. earthwork, foundation inspections, rebar inspection, and concrete when scheduled concurrently at the site.
 - 2. Technician time for services performed will be reimbursed at a regular time rate. Compensation at the overtime rate will be considered for hours over eight (8) hours spent at the site on a single day, field testing services performed on a Saturday or Sunday, and field services performed on a recognized holiday.
 - 3. There shall be a three (3) hour minimum for each scheduled testing service. Vehicle charges will be included on a \$25.00 per trip basis.
 - 4. Cylinder pick up will be controlled by the technician performing test on a scheduled

pick up day. If there are no testing services scheduled, the cylinder pick up fee is \$40.00 on week days and \$50.00 on weekends and holidays with no technician or vehicle charge.

5. Contractor shall bear the responsibility of scheduling the testing services. Contractor and the testing laboratory shall assume full responsibility to coordinate the testing services. Cancellations or failed test shall be reimbursable to the Owner by the responsible party for the cancellations or failure of a test or service.

L. Coordination:

1. Coordinate sequence of activities to accommodate required quality assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting:
 - a. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log:

1. Prepare a record of tests and inspections. Include the following:
 - a. Date test or inspection was conducted.
 - b. Description of the Work tested or inspected.
 - c. Date test or inspection results were transmitted to Architect.
 - d. Identification of testing agency or special inspector conducting test or inspection.
 - e. Deficiency log.

- B. Maintain log at site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 TESTING AND INSPECTION SERVICES

- A. Testing services shall include, but not be limited to those specified below or which are necessary or required during course of construction to ascertain Specification compliance and which may be deemed necessary by Architect, the engineer, or Owner to ensure the quality of the Work.
- B. Owner reserves the right to add to or delete any or all inspection and testing specified, excluding testing required by the applicable building codes.
- C. If conflicts arise between Drawings and Specifications, notify Architect immediately. The most stringent requirements shall dictate procedure.

3.3 TESTING OF EARTHWORK

A. Testing Services (as specified or required):

1. References (as applicable for tests required):
 - a. American Society for Testing and Materials (ASTM):
 - 1) D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³ (600 kN-m/m³).
 - 2) D2922 - Standard Test Method for Density of Soil and Soil-Aggregate In Place By Nuclear Methods (Shallow Depth).

- 3) D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - b. American Association of State Highway and Transportation Officials (AASHTO):
 - 1) T89 - Determining the Liquid Limit of Soils.
 - 2) T90 - Determining the Plastic Limit and Plasticity Index of Soils.
 - 3) T99 - Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb) Rammer and a 305-mm (12-in) Drop.
 - 4) T238 - Density of Soil and Soil Aggregates In Place By Nuclear Methods (Shallow Depth).
 2. Perform sieve analysis to develop grain size distribution curves for materials to be used for subgrade, fill under slab on grade, and backfills.
 3. Establish the moisture density relation of soils to be used as fill using the method best suited to the type of fill material.
 4. Determine moisture content of all fill materials before placement and advise Contractor when it is or is not suitable to achieve required compaction.
 5. Determine Liquid Limit in accordance with ASTM D4318 or AASHTO T89, Plastic Limit in accordance with ASTM D4318, and Plasticity Index in accordance with ASTM D4318 of all fill material,
 6. Perform one (1) in place density test for each 2,500 square feet (280 square yards) of existing subgrade material.
 7. Perform Moisture-Density curve in accordance with ASTM D698 or AASHTO T99 for one type of fill material. If the original choice of material does not meet the Specifications, Contractor shall pay for additional testing.
 8. Perform in place density tests of each lift of compacted fill at locations adequate to evaluate the degree of compaction of all fill areas. Conduct one test for each 2,500 square feet (280 square yards) of each lift of compacted fill.
 9. Perform testing at a frequency of one (1) in-place density and moisture test for each 75 lineal feet or less of utility trench, with a minimum of three (3) tests per lift
- B. Reports:
1. Submit reports with the following information:
 - a. Type and condition of soil at footing bottoms.
 - b. Level of water table in the excavated areas.
 - c. Grain size distribution of fill materials (average of three [3] tests).
 - d. Moisture density test results.
 - e. In place density test results with moisture content and relative density of each layer of compacted fill. Include with in place density test results, a plan showing location of each test.
 - f. Notify Architect by telephone within one (1) hour of the discovery of the following conditions and follow up telephone notification with written report:
 - 1) Materials used or degree of soil compaction not meeting specified requirements.
 - 2) Frost and freeze protection requirements for excavation bottoms not being complied with.
 - 3) Water in excavations not being removed prior to Work being performed in excavation.

3.4 INSPECTION OF PIPED SITE UTILITIES

- A. Laboratory representative shall observe and report on the following:
1. Proper alignment and grade of trenches.
 2. Pipe bedding and supports.
 3. Pipe, joints, jointing material, and thrust blocks prior to installation of pipe.
 4. Installation of pipe and joints.
 5. Testing of piped utilities performed by Contractor.

3.5 PAVING

- A. Testing Services:
 - 1. Perform field tests for moisture density properties:
 - a. Provide field testing of the subgrade as specified.
 - b. Paving sub-base: Provide one (1) field test for every 5,000 square feet of area of crushed limestone or caliche sub-base.
 - c. Lime treated subgrade: Provide one (1) field test for every 5,000 square feet of area of lime treated subgrade for content of lime and subgrade compaction.
 - d. Cement soil stabilization: Provide one (1) field test for every 5,000 square feet of area of cement stabilized subgrade for content of cement and subgrade compaction.

3.6 PIER DRILLING OPERATION

- A. A representative of a qualified geotechnical laboratory shall provide services specified.
- B. Laboratory representative shall make continuous inspections to determine that proper bearing stratum is obtained and utilized for bearing and that shafts are properly clean and dry before placing concrete.
- C. Laboratory shall furnish complete pier log showing the diameter, top and bottom elevations of each pier, casing required or not required, actual penetration into bearing stratum, elevation of top of bearing stratum, volume of concrete used, and deviations from specified tolerances.
- D. Laboratory representative shall make continuous inspections of drilled pier construction to check the following:
 - 1. Verify soundness of bearing stratum and desired penetration.
 - 2. Verify pier dimensions and reinforcing used.
 - 3. Monitor condition of hole and removal of water and loose material from bottom.
 - 4. Monitor placement of concrete and use of tremie or pumps.
 - 5. Monitor the extraction of casing, if used.
- E. Request probe holes when deemed necessary to confirm safe bearing capacity.

3.7 CONCRETE REINFORCING STEEL AND EMBEDDED METAL ASSEMBLIES

- A. Inspect concrete reinforcing steel prior to placing concrete for compliance with Contract Documents and approved shop drawings. Noncompliance with Contract Documents and approved shop drawings shall be immediately brought to the attention of Contractor for correction and, if left uncorrected, reported to Architect.
- B. Laboratory representative shall observe and report on the following:
 - 1. Number and size of bars.
 - 2. Bending and lengths of bars.
 - 3. Splicing.
 - 4. Clearance to forms, including chair heights.
 - 5. Clearance to sides and bottom of trench if soil formed.
 - 6. Clearance between bars or spacing.
 - 7. Rust, form oil, and other contamination.
 - 8. Grade of steel.
 - 9. Securing, tying, and chairing of bars.
 - 10. Excessive congestion of reinforcing steel.

11. Installation of anchor bolts and placement of concrete around such bolts.
 12. Fabrication and installation of embedded metal assemblies, including visual inspection of all welds.
 13. Visually inspect studs and deformed bar anchors on embedded assemblies for compliance with Contract Documents. Check number, spacing, and weld quality. If, after welding, visual inspection reveals that a sound weld or a full 360-degree fillet has not been obtained for a particular stud or bar, such stud or bar shall be struck with a hammer and bent 15 degrees off perpendicular and then bent back into position. Anchors failing this test shall be replaced.
- C. Provide a qualified, experienced inspector to inspect reinforcing steel. Inspector shall have a minimum of three (3) years of experience inspecting reinforcing steel in projects of similar size.

3.8 CONCRETE INSPECTION AND TESTING

- A. Receive and evaluate proposed concrete mix designs submitted by Contractor. If mix designs comply with Drawings and Specifications, the laboratory shall submit a letter to the Architect certifying compliance. Mix designs not complying with Drawings and Specifications shall be returned by the laboratory as being unacceptable. Check the proposed mixes for proportions, water cement ratio, and slump in accordance with ACI 613 and 318.
- B. Comply with ACI 311 *Guide For Concrete Inspection* and ACI *Manual of Concrete Inspection*.
- C. Sample and test concrete placed at the site in accordance with ASTM C172. Each sample shall be obtained from a different batch of concrete on a random basis.
- D. Test concrete:
1. Mold and cure five (5) specimens from each sample:
 - a. For each 50 cubic yards or fraction thereof of structural building concrete.
 - b. For each 100 cubic yards or fraction thereof of nonstructural concrete and site Work paving and sidewalks.
 - c. Laboratory cure two (2) cylinders in accordance with ASTM C192.
 - d. Field cure remaining cylinders in accordance with ASTM C31.
 2. Two (2) specimens shall be tested at seven (7) days for information, two (2) shall be tested at 28 days for acceptance.
 3. Store one (1) cylinder for testing at 56 days in the event the 28-day strength tests do not meet strength requirements.
- E. Deviations from the requirements of ASTM specifications shall be recorded in the test report. Test concrete specimens in accordance with ASTM C39.
- F. Specimens for pumped concrete shall be taken at the discharge end of pumping equipment.
- G. Supervise curing and protection provided for test specimens in field and transportation from the field to laboratory. Test cylinders shall be stored in the field for 24 hours and then carefully transported to laboratory and cured in accordance with ASTM C31.
- H. Make one (1) strength test (four [4] cylinders) of each mix design of concrete placed in any one (1) day.
- I. Make one (1) slump test for each set of cylinders following procedural requirements of ASTM C143 and ASTM C172. Make additional slump tests whenever consistency of concrete

appears to vary. Slump tests corresponding to samples from which strength tests are made shall be reported with strength test results. Other slump tests need not be reported.

- J. Determine total air content of air entrained normal weight concrete sample for each strength test in accordance with ASTM C231.
- K. Determine air content and unit weight of lightweight concrete sample for each strength test in accordance with ASTM C173 and ASTM C567.
- L. Determine temperature of concrete sample for each strength test.
- M. Inspect each batch of concrete and monitor addition of mixing water to assure uniform consistency from truck to truck. Check mixing form mixers before mix begins to set and within time limits set forth in ASTM C94:
 - 1. Monitor addition of water and high range water reducer to concrete at job site and length of time concrete is allowed to remain in truck during placement.
- N. Testing agency shall furnish and maintain a competent inspector at the mixing plant at the start of each day's mixing. Inspector shall examine concrete materials for compliance with Specifications and approved mix design, weighing and measuring devices, proportioning and mixing of materials, water and cement content of each batch, general operation of the plant, and transportation of concrete to jobsite. Inspector shall verify that the amount of free surface moisture contained in fine and course aggregate has been properly accounted for in the concrete mixing to achieve required consistency and water cement ratio.
- O. Testing laboratory shall monitor addition of water to concrete at the jobsite and the length of time concrete is allowed to remain in the truck before placement. Inspector shall compare mixture with criteria on the approved mix design and report any significant deviation to Architect, Contractor, and concrete supplier. Do not permit addition of water that will exceed maximum water/cement ratio for the mix as given on the approved mix design.
- P. Observe placing of concrete except nonstructural slabs on grade and site Work. Observe and report on placing method, consolidation, cold joints, length of drop, and displacement of reinforcement. Report deficiencies to Contractor immediately for corrective action. Inspections may be reduced to a periodic basis when all procedures have been deemed satisfactory by the laboratory.
- Q. Test reports shall include but not be limited to the following information:
 - 1. Date of concrete placement.
 - 2. Concrete mix identification number or proportion of ingredients.
 - 3. Truck ticket number.
 - 4. Time test was made.
 - 5. Time of batching.
 - 6. Location of each placement.
 - 7. Slump, unit weight, water content (microwave test), and air content of concrete sampled.
 - 8. Date and results of strength test.
- R. Report promptly to Architect all details of reasons for rejection of any and all quantities of concrete. Give all information concerning locations of the concrete pours, quantities, date of pours, and other pertinent facts concerning concrete represented by the specimens.
- S. Testing laboratory shall certify each delivery ticket indicating class of concrete delivered (or placed), amount of water added and time at which cement and aggregate were dispensed

into the truck, and time at which concrete was discharged from the truck.

- T. Evaluation and Acceptance:
 - 1. If measured slump or air content of air entrained concrete falls outside specified limits, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, concrete shall be considered to have failed to meet the requirements of the Specifications, and shall not be used in the structure.
 - 2. Strength level of concrete will be considered satisfactory if the averages of sets of three (3) consecutive strength test results are equal to, or exceed, specified strength and no individual test result (average of two [2] cylinders) is below specified strength by more than 500 psi.
 - 3. Completed concrete work will be accepted when requirements of ACI 301 Chapter 18 *Specifications for Structural Concrete for Buildings* have been met.
- U. Concrete Test Reports:
 - 1. Reports shall be made and distributed immediately after respective tests or inspections are made:
 - a. Where reports indicate deviations from Contract Documents, they shall also include a determination of the probable cause of deviation and where applicable, a recommendation for corrective action.
- V. Furnish a statistical analysis for each class of concrete placed on the Project in accordance with ACI 214 and ACI 318. Information shall be updated and distributed once a month as directed by the Architect. Information shall include, but not be limited to, the following:
 - 1. Strength tests at seven (7) days.
 - 2. Strength tests at 28 days of two (2) cylinder averages.
 - 3. 28-day moving average strength tests of last three (3) test groups.
 - 4. Standard deviation and coefficient of variation based on 28-day strength tests.
 - 5. Average strength and number of 28-day tests for most recent month.
 - 6. Strength test one (1) cylinder at 56 days in the event the 28-day strength tests do not meet strength requirements.
- W. Test Footings (Shafts; Piers; Caissons): Same diameter and type specified for footings, placed in same manner. Accepted test footings may be used in the Work.
- X. Noncompliant Test Reports: Fax test reports indicating noncompliance immediately to each party on the test report distribution list. Copies shall be on different colored paper.
- Y. Inspect application of curing compound and monitor curing conditions to assure compliance with Specification requirements. Report curing deficiencies to Contractor immediately and submit a written report to Architect.

3.9 TESTING OF NONSHRINK GROUT

- A. Make one (1) strength test for all plates grouted and for all grout used in joints between members.
- B. Each test shall consist of four (4) cubes, two (2) tested at seven (7) days and two (2) at 28 days, made and tested in accordance with ASTM C109, with the exception that grout shall be restrained from expansion by a top plate.

3.10 STRUCTURAL STEEL

- A. Inspect structural steel during and after erection for compliance with Contract Documents

and shop drawings. Review and report on fabricator's quality control procedures and capabilities.

- B. Field Inspection:
1. Proper erection of pieces.
 2. Proper touch up painting of shop primed structural steel exposed to view or in crawl space.
 3. Proper installation of bolts.
 4. Plumbness of structure and proper bracing.
 5. Proper field painting.
 6. Initial inspection of welding process and periodically thereafter as necessary.
 7. Visual examination of completed welds.
 8. Ultrasonic testing of penetration field welds.
 9. Installation of field welded shear studs.
 10. Inspect shop fabricated members, upon arrival at the site, for defects incurred during transit and handling.
 11. Measure and record camber of beams upon arrival and before erection for compliance with specified camber. Measure lying flat with web horizontal. Return members outside specified camber tolerance to shop for correction.
- C. Qualifications of Welders: Fabricator and erector shall provide the testing laboratory with names of welders employed on Work, along with certification that each welder has passed qualification tests within the past 12 months, using procedures covered in AWS D1.1 *Structural Welding Code - Steel*. Verify welder qualifications.
- D. Inspection of Field Welding shall Include:
1. Visually inspect fillet welds for size, soundness, and proper return around ends. Inspect seams, folds, and delaminations.
 2. Visually inspect welds for proper repair of painting.
 3. Ultrasonically test penetration welds in accordance with ASTM E164.
 4. Inspect surfaces to be welded. Note surface preparations, fit up, and cleanliness of surface. Verify electrodes for size, type, and condition.
 5. Welding inspector shall be present during alignment and fit up of members being welded, and shall verify for correct surface preparation of root openings, sound weld metal, and proper penetration in the root pass. Where weld has not penetrated completely, inspector shall order the joint to be chipped down to sound metal, or gouged out, and rewelded. Thoroughly inspect root passes for cracks. Gouge out cracks and rewelded to two inches (2") beyond each end of crack.
 6. Inspector shall verify that welds have been marked with welder's symbol and shall mark welds requiring repairs and re-inspection. Inspector shall maintain a written record of welds. Work completed and inspected shall receive an identification mark by the inspector. Identify unacceptable material and Work identified by word *reject* or *repair* marked directly on the material.
 7. Testing agency shall advise the Owner and Architect of any shop and/or field conditions that may require further tests and examination by means other than those specified. Additional tests and examinations shall be performed as authorized by the Owner and Architect.
 8. Owner reserves the right to use ultrasonic or radiographic inspection to verify adequacy of welds. Testing procedures and acceptance criteria shall be as specified in AWS D1.1.
 9. Weld quality to comply with the American Institute of Steel Construction (AISC) Manual of Steel Construction.
 10. Determine percentage of weld tested by the number of welds that fail the initial testing.
 11. Reweld and retest welds that fail until the welds pass. Test two (2) additional welds for every weld failure.

- E. Inspect bolted construction in accordance with AISC *Specification for Structural Steel Buildings*:
 - 1. Visually inspect bolts ensuring that plies have been brought into snug contact.
 - 2. Inspect high strength bolt in accordance with Section 9 of the *Specifications for Structural Joints Using ASTM A325 Bolts*.
- F. Inspect stud welding in accordance with AWS D1.1 *Structural Welding Code*:
 - 1. Weld at least two (2) shear studs at the start of each production period to determine correct generator, control unit, and stud welder setting. The studs shall be capable of being bent 45 degrees from vertical without weld failure.
 - 2. When the temperature is below 32 degrees F, test one (1) stud in each 100 after cooling. Do not weld studs at temperatures below zero (0) degrees F or when surface is wet with rain or snow. If stud fails in the weld, two (2) new studs shall pass the test before resumption of welding.
 - 3. Visually inspect studs for compliance with the requirements of the Contract Documents. Verify number, spacing, and weld quality. If, after welding, visual inspection reveals that a sound weld or a full 360-degree fillet has not been obtained for a particular stud, that stud shall be struck with a hammer and bent 15 degrees off perpendicular in the direction away from the missing weld. Studs failing test shall be replaced.

3.11 REINFORCING STEEL MECHANICAL SPLICES

- A. Inspection and Observation Services:
 - 1. Visually inspect and report on completed condition of each mechanical splice of reinforcing steel.
 - 2. Visually inspect each mechanical splice to ensure compliance with the ICC-ES Reports and the manufacturer's published criteria for acceptable completed splices.
 - 3. Place special emphasis on the inspection of the end preparation of each bar to be spliced required by the ICC-ES Report.
- B. Reports:
 - 1. Submit reports to Architect:
 - a. Copies of manufacturer's published criteria for acceptable completed splices prior to observing mechanical splices.
 - b. Reports on each mechanical splice shall indicate location of the splice, size of bars spliced, and acceptability or rejection of splice. Indicate reasons for rejection on each report.

3.12 OPEN WEB JOISTS AND JOIST GIRDERS

- A. Inspect joists at jobsite for compliance with specified fabrication requirements. Verify welded connections between web and chord, splices, and straightness of members.
- B. Inspect installation of joists at jobsite. Check connections to supporting members, chord extensions, number of rows of bridging, and bridging connections for compliance with Contract Documents and referenced standards.
- C. Verify welder qualification certificates for both shop and field welding operators.

3.13 METAL FLOOR DECK

- A. Field inspection shall consist of:
 - 1. Verifying types, gauges, and finishes for compliance with Contract Documents and

- shop drawings.
- 2. Examine composite floor deck exposed to crawl space for damage to galvanizing due to welding or construction activities. Repair galvanized composite floor deck in accordance with the Specifications.
- 3. Examine the erection of metal deck, fastenings, reinforcing of holes, deck reinforcing, miscellaneous deck supports, hanger tabs, shear studs, deck closures, painting, or other coating.
- 4. Certification of welders.
- 5. Inspect and test field welded shear studs used to fasten metal floor decking to supporting steel as specified for structural steel.

3.14 METAL ROOF DECK

- A. Field inspection shall consist of:
 - 1. Verify types, gauges, and finishes for compliance with Contract Documents and shop drawings.
 - 2. Examine the erection of the metal deck, including fastenings at supports and side laps, reinforcing of holes, and miscellaneous deck supports.
 - 3. Certification of welders.
 - 4. Visual inspection of at least 25 percent of welds.

3.15 SPRAYED FIREPROOFING

- A. Verify that applied thickness, density, and bond strength of sprayed fireproofing meets fire rating requirements of approved design.
- B. Verify that installation complies with fire rating requirements of approved design.
- C. Inspect and test for thickness:
 - 1. Test 25 percent of structural frame columns and beams in each building level.
 - 2. Test ten percent (10%) of beams other than structural frame in each building level.
 - 3. Test one (1) slab per 5,000 square feet of building area.
- D. Inspect and test in accordance procedures of ASTM E605 and ASTM E736.

3.16 EXPANSION BOLT INSTALLATION

- A. Inspect drilling of each hole and installation of each expansion bolt for compliance with Contract Documents and shop drawings.
- B. Verify installation torque for each expansion bolt for compliance with manufacturer's installation instructions.

3.17 LIGHTWEIGHT INSULATING CONCRETE FILL

- A. Inspection and Observation Services (As Required):
 - 1. Inspection of roof deck prior to start of Work.
 - 2. Inspection during installation of insulation and lightweight insulating concrete fill Work to ascertain compliance with Contract Documents.
 - 3. Observation of base ply fastener pull tests performed by Contractor to ascertain minimum withdrawal resistance of 40 pounds per fastener.
- B. Testing Services (As Required):
 - 1. References (as applicable for tests required):

- a. American Society for Testing and Materials (ASTM):
 - 1) C177 - Standard Test Method for Steady State Heat Flux Measurements and Thermal Transmission Properties By Means of the Guarded Hot Plate Apparatus.
 - 2) C495 - Test Method for Compressive Strength of Lightweight Insulating Concrete.
 - 3) C578 - Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- 2. Test EPS insulation board for thermal insulation value in accordance with ASTM C177.
- 3. Test lightweight insulating concrete fill in accordance with ASTM C495 for:
 - a. Mix design compressive strength.
 - b. Mix design wet and dry density range.
 - c. Number of Tests:
 - 1) One (1) per 5,000 square feet.
 - 2) Not less than one (1) for each day's Work.
- 4. Test EPS insulation board for density in accordance with ASTM C578.

3.18 TESTING OF ROOFING

- A. Inspection and Observation Services (As Required):
 - 1. Inspection of roof deck prior to start of Work.
 - 2. Inspect onsite condition of stored roofing materials.
 - 3. Inspection during roofing, roof insulation, and sheet metal Work to ascertain compliance with Contract Documents.
 - 4. Observation of roof test cuts performed by Contractor to ascertain that they are properly made.
 - 5. Observation of patching of roof test cuts to ascertain that they are properly made.
- B. Testing Services (As Required):
 - 1. Perform dissection and analysis on cuts provided by Contractor to confirm number of plies, bonding of plies, weight of bitumen and softening temperature to ascertain compliance with Specifications.

3.19 MASONRY

- A. Inspection and Observation Services:
 - 1. Inspection of placement of reinforcement including condition, grade, size, location, spacing, and lap splices.
 - 2. Review mortar design mixes.
 - 3. Inspection of laying, mortaring, and grouting of concrete masonry units and elements.
- B. Testing Services:
 - 1. References (as applicable for tests required):
 - a. ASTM International (ASTM):
 - 1) C140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units.
 - 2) C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
 - 3) C1019 - Standard Test Method for Sampling and Testing Grout.
 - 2. Testing of Concrete Masonry Units (CMU):
 - a. Pre-construction - Perform the following tests in accordance with ASTM C140:
 - 1) Compressive Strength.
 - 2) Absorption.
 - 3) Weight.
 - 4) Moisture Content.
 - 5) Dimensions.

3. Mortar Tests:
 - a. Pre-construction - Perform the following tests in accordance with ASTM C780 on each type of mortar mix used on the Project:
 - 1) 28-day compressive strength.
 - 2) Water retention.
 - b. Construction: Perform 28-day compressive strength test in accordance with ASTM C780 on each type of mortar mix used on the Project at the rate of one (1) test per 2,000 square feet of masonry.
4. Refer to and include Work for reinforcing steel specified.
5. Grout tests:
 - a. Pre-construction - Perform the following tests in accordance with ASTM C1019 on each type of grout mix used on the Project:
 - 1) Slump test.
 - 2) 28-Day compressive strength.
 - b. Construction: Perform 28-day compressive strength test in accordance with ASTM C1019 on each type of grout mix used on the Project at the rate of one (1) test per 2,000 square feet of masonry.
6. Prism test: Perform pre-construction 28-day compressive strength test on concrete masonry walls.

3.20 REPAIR AND PROTECTION

- A. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes:
 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 10: Cutting and Patching.
- B. Protect construction exposed by or for quality control service activities.
- C. Repair and protection are Contractor's responsibility regardless of the assignment of responsibility for quality control services.

END OF SECTION 01 45 23

DOCUMENT 01 45 24

ENVIRONMENTAL IMPORT MATERIALS TESTING

PART 1 – GENERAL

This Section specifies the requirements for the import request process, sampling, testing, transportation, and certification of imported fill materials (i.e., earth materials, such as, mulch, soil, rock, crushed aggregate base, sand, asphalt, compost, planter mix) to school sites.

1.01 SUMMARY

- A. This Section defines:
 - 1. Submittal requirements.
 - 2. Requirements for use of existing or imported materials on school sites.
 - 3. Testing requirements for all materials imported for use on a school site.
 - 4. Requirements for stockpiling materials for use on school sites.
- B. RELATED DOCUMENTS AND PROVISIONS
 - 1. General Conditions.
 - 2. Section 01 11 00: Summary of Work.
 - 3. Section 01 31 00: Coordination and Project Meetings.
 - 4. Section 01 32 16: Construction Schedule – Network Analysis.
 - 5. Section 01 33 00: Submittals
 - 6. Section 31 22 15: Finish Grading.
 - 7. Section 31 23 33: Trench Excavation and Fill.
 - 8. Section 32 11 23: Aggregate Base
 - 9. Section 32 15 40: Decomposed Granite Surfacing

1.02 OBJECTIVES

- A. Ensure that fill materials imported to school sites are free of known, suspect, and expected environmental contaminants.
- B. Ensure that materials imported to school sites comply with any and all applicable California Code of Regulations (CCR), Code of Federal Regulations (CFR), California Environmental Protection Agency (Cal EPA), Air Quality Management District (AQMD), and Department of Toxic Substances Control (DTSC) requirements for school site use.
- C. Ensure that necessary and accurate documentation (e.g., SDS (Safety Data Sheets), Product Specifications, Asbestos-Free Certifications, “Request for Import Material Testing” form, etc., be provided to the District. A sufficient number of samples must be collected per characterization requirements, and the resulting data collected by the District’s consultant will be provided to the District. Analytical determinations can then be made in regard to the first two objectives.

1.03 SUBMITTALS

Contractor shall submit to the District, District’s Construction Manager (CM), and District’s Environmental Compliance Manager (ECM), or their Designee:

- A. Within twenty (20) calendar days of receipt of Notice to Proceed, the Contractor shall submit a spreadsheet listing all required import material types including but not limited to backfill soil, mulch, soil improvements, sand, gravel, crushed aggregate base, and rock aggregate for use in asphalt, concrete, or other purposes **(NO Crushed Miscellaneous Base (CMB) allowed for use on District projects)**. The list shall include estimated volumes for each material type, and the desired vendor location each contractor intends to utilize. See 2.01B for pre-evaluated sites, sites subject to change. If this twenty (20) day timeframe is not met, the Contractor takes responsibility for delays associated with import testing.
- B. Prior to the import of material, from a District pre-evaluated site, the Contractor must provide a "Request for Import Material Testing" form a minimum of two (2) weeks prior to needing material on site. District to provide "Request for Import Material Testing" form. Contractor shall be solely responsible for any schedule delay(s) and/or associated cost arising from pre-evaluated sites if this two (2) week timeframe is not met. Should any parameters on the Import Material Testing Form change post-approval, the ECM or their Designee must be notified immediately and provided with a revised form for a new approval.
- C. For a non-pre-evaluated site and/or material, Contractor must provide "Request for Import Material Testing" form a minimum of four (4) weeks prior to import. **Contractor is responsible for associated costs from facilities which have not been tested and are listed on the current prequalified import list and the requested materials are available. If requested materials are not available on the pre-approved list, District to cover associated costs with initial testing. If materials are found unsuitable, and additional testing is needed, all associated costs to be paid by Contractor.**
- D. Contractor to Submit signed memorandum to the District and Construction Manager, prior to import, verifying that the hauling contract specifies "clean" trucks and that the actual haul trucks utilized for import activities will be clean of visible contamination or deleterious materials.
- E. Contractor to Submit, within five (5) business days of the completion of the import activities, a signed memorandum verifying that the trucks went directly from the source location to the recipient location with no detours or stops at other locations and that short loads were not augmented by other materials that were not tested as part of the final import. All import transportation activities shall be conducted in accordance with all applicable (local, State, Federal) rules and regulations.
- F. Certification, in the form of haul tickets or bill of lading, documenting the volume and receipt of all import materials and activities. This documentation shall be coordinated through the District, Construction Manager, and ECM, or their Designee. Contractor shall provide, track, and maintain a log of all imported materials.
1. For approved import to school project sites, haul tickets will be utilized, and shall contain the following minimum information:
- Date(s) of haul activity.
 - Address of source site.
 - Address of receiving site.
 - Load volume.
 - Day of departure from source.
 - Day of arrival at receiving site.
 - Signature of recipient or recipient's agent.

1.04 APPROVALS

Import of soil, mulch, granular base, asphalt, concrete, or geotechnical grading or filling materials at District sites will occur ONLY with PRIOR approval of the District through the ECM, or their Designee, for environmental considerations and the geotechnical professional assigned to the project for geotechnical considerations.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Imported:

1. Soils and mulch: Soils proposed for import shall be tested pursuant to the requirements as outlined in Part 3 of this Section.
2. Gravels/CAB: Clean gravel, consisting of native rock from a commercial source, shall be tested pursuant to the requirements of this Section. Refer to part 2.01.B, of this Section, for District pre-evaluated sites.
3. Sands: Clean sand from a commercial source shall be tested pursuant to the requirements of this Section. Refer to part 2.01.B, of this Section, for District pre-evaluated sites. Plaster sand is included in this classification and must be tested per the requirements in this section.
4. Asphalt/Concrete: Asphalt and concrete materials shall be certified to be free of asbestos containing material (ACM) by complying with the following requirements: Contractor shall provide SDS (Safety Data Sheets) and Manufacturer certification that indicates asphalt/cement is asbestos free, including a letter from the rock quarry/supplier that the aggregate (i.e., CAB) used in production of the asphalt or concrete is asbestos-free.
5. Miscellaneous Material: No crushed miscellaneous material (CMB) containing crushed concrete, asphalt, construction debris, recycled, or other potential deleterious materials may be utilized or imported to a District project site for use as fill or grading material. No miscellaneous asbestos containing material to be used as part of asphalt or concrete installation.

- B.** Request Long Beach Unified School District’s (District) Pre-Evaluated Site list for imported materials – NOTE this list is subject to change and therefore, must be requested prior to an import request is completed and submitted. The District’s “Request for Import Material Testing” form must be reviewed prior to import:

Materials at the facilities presented in the Pre-Evaluated Import list have been previously tested and approved.

PART 3 – EXECUTION

3.01 SAMPLING AND TESTING

- A. Contractor must coordinate with the District to request testing for non-pre-evaluated materials and sites. Please note, any request for turn-around time (TAT) less than three (3) business days will be rejected. District will attempt to honor rushed TAT request; however, it is subject to availability of laboratory capacity, analytical method procedures, and field sampling personnel. Contractor’s submission of a request for a faster TAT (for analytical results) should not be construed as District’s approval for such requests. District shall not be liable in any way if such request could not be approved and/or honored.
- B. All fill/grading material must be tested at the site of origin. District retains the right to refuse import of fill material(s) from any particular site even if it is a pre-evaluated site. Worst-case, District retains the right to stop trucks mid-import should the District or ECM, or their Designee, learn of unauthorized import hauling (i.e., if no approval from the ECM, or their Designee, has been issued

prior to import activities) for the imported material in question. Contractor will be responsible for any schedule changes/delays concerning the unauthorized import of materials and any costs pertaining to testing, removal and site cleanup as determined by the ECM, or their Designee.

- C. Imported fill material may be deemed defective for use by the Environmental Compliance Manager, or their Designee, at a school site if any of the following results are obtained:
 - 1. Total petroleum hydrocarbons (TPH) are present at concentrations exceeding 10 milligrams per kilogram (mg/kg) for gasoline range organics, and/or 100 mg/kg for diesel range organics, and/or 500 mg/kg for oil range organics.
 - 2. Solvents and other volatile organic compounds (VOCs) are present at concentrations exceeding the human health risk levels for unrestricted land use and/or hazardous waste characterization criteria, whichever is lower.
 - 3. Polychlorinated Biphenyl (PCBs) are present at concentrations exceeding the human health risk levels for unrestricted land use and/or hazardous waste characterization criteria whichever is lower.
 - 4. Semi volatile organic compounds (SVOCs) are present at concentrations exceeding the human health risk levels for unrestricted land use and/or hazardous waste characterization criteria whichever is lower.
 - 5. Organochlorine Pesticides (OCPs) are present at concentrations exceeding the human health risk levels for unrestricted land use and/or hazardous waste characterization criteria, whichever is lower.
 - 6. Chlorinated herbicides are present at concentrations exceeding the human health risk levels for unrestricted land use and/or hazardous waste characterization criteria, whichever is lower.
 - 7. California Code of Regulations Title 22 (CAM 17) Metals at concentrations exceeding human health risk levels for unrestricted land use or typical background levels expected in California and/or hazardous waste characterization criteria whichever is lower.
 - 8. Hexavalent chromium is present at concentrations exceeding 15 mg/kg or failing hazardous waste STLC leachate criteria.
- D. Test results and associated approvals by Environmental Compliance Manager, or their Designee, shall be valid for a period of 90 days from the date of the subject testing. Previously approved materials shall not be utilized after the 90-day limit without prior review and approval by the ECM, or their Designee.
- E. Imported fill materials can only be stockpiled by the Contractor (or the facility) at the receiving site once it is demonstrated to the satisfaction of ECM, or their Designee, that the subject materials meet the requirements of this Section. Should a rain event occur while the material is stockpiled, appropriate measures must be taken to ensure the stockpile is covered and protected and does not accumulate water or runoff.
- F. Apply appropriate dust control measures to prevent dust generation from importing stockpiles/materials; and be compliant with appropriate rules and regulations prescribed by the South Coast Air Quality Management District. Always maintain dust control measures under all environmental conditions. Contractor generating stockpile shall be held fully responsible for any violation(s) arising out of non-compliance related to air quality issues associated with the stockpile.
- G. Apply appropriate storm water pollution prevention best management practices (BMPs) on and around the imported stockpiles. Contractor generating stockpile shall be held fully responsible for any violation(s) arising out of non-compliance related to storm water pollution issues associated with the stockpile.

3.02 TRANSPORTATION

- A. Details of the samples and testing must be approved by ECM, or their Designee, before the materials from which the samples were collected undergo transportation.
- B. Haul Routes and Regulations/Restrictions: Contractor must comply with requirements of project environmental disclosure documents (e.g.: CEQA (California Environmental Quality Act) EIR) and authorities having jurisdiction over the project area and the proposed activities (e.g., Regional Water Quality Control Board, DTSC, etc.).

3.03 COSTS

- A. District will incur the costs of testing for pre-evaluated sites, see 2.01B of this section for additional information.
- B. **Contractor shall pay all fees for testing any non-pre-evaluated materials provided the material is already available and listed on the current pre-evaluated import list. If the material is not on the current pre-evaluated import list, District will pay for the first laboratory test, and if the results are deemed unacceptable, the Contractor shall be responsible for paying for all additional testing. Contractor shall be solely responsible for any schedule delay(s) associated with testing any non-pre-evaluated site.**
- C. Contractor shall pay all fees for loading, hauling, and importing fill materials identified in the contract documents.
- D. If fill material is imported from any site without prior written approval from District and/or from a previously un-evaluated source(s), Contractor shall remove such material from the District's site at Contractor cost immediately upon discovery of such. Any delay in removal of such material may incur liquidated damages for each day such violation continues. In addition, under such a scenario, the Environmental Consultant may collect necessary samples from the area(s) where the said material has been placed (if deemed necessary). All costs associated with such (including sampling, testing, further delineation, removal and disposal of impacted materials, field oversight, consulting, legal charges, and regulatory oversight fees) efforts shall be the Contractor's sole responsibility.

END OF DOCUMENT

DOCUMENT 01 45 25

ENVIRONMENTAL EXPORT MATERIALS TESTING

PART 1 – GENERAL

This Section specifies the requirements for the pre-export notification, sampling, testing, intra-District reuse, transportation, disposal, and associated documentation of pre-approved exported materials (i.e., excess soil and/or environmental waste) from school sites.

1.01 SUMMARY

- A. This Specification defines:
 - 1. Submittal requirements.
 - 2. Testing requirements for all materials exported, stockpiled, or generated for use on a school site.
 - 3. Requirements for exporting materials from a school site including transportation, disposal, and reporting requirements.
- B. RELATED SECTIONS
 - A. General Conditions.
 - B. Section 01 11 00: Summary of Work.
 - C. Section 01 31 00: Coordination and Project Meetings.
 - D. Section 01 32 16: Construction Schedule – Network Analysis.
 - E. Section 01 33 00: Submittals.
 - F. Section 03 30 00: Cast-in-Place Concrete
 - G. Section 31 22 15 Finish: Grading.
 - H. Section 31 23 33: Trench Excavation and Fill.
 - I. Section 32 11 23: Aggregate Base.
 - J. Section 32 12 16: Asphalt Concrete Paving

1.02 OBJECTIVES

- A. Ensure that materials exported from school sites for District reuse or for offsite disposal/recycling are adequately documented, tracked, and characterized for lawful disposition.
- B. Ensure that materials exported from school sites comply with California Code of Regulations (CCR) Title 22, 40 CFR (Code of Federal Regulations), California Environmental Protection Agency (Cal EPA) requirements, Air Quality Management District (AQMD), and Department of Transportation (DOT) requirements (e.g., including but not limited to the separation of Hazardous and Non-Hazardous material into individual rigid containers.)
- C. Ensure that concrete and asphalt are characterized prior to saw cutting or otherwise impacting the material in such a way that creates dust. See related section 1.03 K.
- D. Ensure that sufficient samples are collected and the corresponding data is provided to the District (e.g., including but not limited to examples such as TCLP, STLC, and TTLC (total Lead content) results). Analytical determinations can then be made in regard to the objectives listed above and confirmed by the District's Hazardous Material Oversight Consultant, Professional Geologist, or Professional Engineer.

1.03 SUBMITTALS

Contractor shall submit to Long Beach Unified School District (District), District's Construction Manager (CM), and District's Environmental Compliance Manager, or their Designee (ECM) the following:

- A. An Export Materials Request Form for non-pre-characterized soil. Export request shall only be submitted after the stockpile is fully generated. Must allow at least **fourteen (14) calendar days** for stockpile to be sampled and analytical results to be received (which includes a **5-business day** Turn Around Time [TAT (Turn Around Time)] for laboratory analysis of samples). Should the Contractor request faster TAT (Turn Around Time) for analytical results, refer to provisions under Section 3.04 COSTS. Stockpile shall not be added to or subtracted from once analytical samples have been taken. Once laboratory report and write-up are provided by the District Environmental Consultant to the Environmental Compliance Manager, or their Designee, with recommendations, see 1.03B for full list of additional submittal requirements prior to export that shall be provided to the Environmental Compliance Manager, or their Designee.
- B. An Export Materials Request Form for pre-characterized soil. If the material is in place and has been pre-characterized), and an applicable soil pre-characterization report is available for soils to be excavated, then Contractor shall provide the following and the Environmental Compliance Manager, or their Designee, must review and approve the full submittal package 14 calendar days prior to conducting export or conducting next steps:
 - (1) District "Request for Export Material Testing" form,
 - (2) map highlighting and confirming the source area, request from District, a CAFM (Computer Aided Facility Management) Site Plan,
 - (3) an applicable report or pre-characterization report (shall be prepared by District approved professionally certified Consultant hired by the District),
 - (4) draft hazardous or non-hazardous manifest or bill of lading,
 - (5) receiving facility acceptance letter with specific language to be provided by the Environmental Compliance Manager or their Designee (i.e., applicable to both landfills and recycling facilities),
 - (6) waste profile if applicable (e.g., certain facilities provide a waste profile number associated with their acceptance),
 - (7) email confirmation that potable water is used in the event that boring sludge is generated. In the unlikely event that non-potable water is used during boring activities, boring sludge must be tested and disposed of appropriately. Contractor shall incur the testing cost in this scenario.
- C. If a boring method is used, in lieu of traditional trenching methods, potable water shall be used during the boring process and shall be confirmed with the District via email prior to initiation of boring activities.
 - a. If soil pre-characterization in the boring area indicates that the soil is non-hazardous, below applicable health screening levels, and acceptable for reuse, then an email shall be sent to the District, District's Construction Manager (CM), and District's Environmental Compliance Manager, or their Designee (ECM), District indicating and confirming that potable water will be used. If potable water is used in boring areas with the soil characterization indicated, then the sludge may be mixed with this soil and used as backfill upon review and email approval by the Environmental Compliance Manager, or their Designee. If export of the material needs to occur after mixing with the clean soil, see section 1.03 B for submittal requirements.

- b. If soil pre-characterization in the boring area indicates that the soil is hazardous, exceeds applicable health screening levels, or is otherwise not acceptable for reuse, then the sludge must be contained, tested, and disposed of appropriately. See section 1.03 B
- D. For potentially hazardous building materials, including but not limited to, lead, asbestos, or PCB (Polychlorinated Biphenyl) materials, Contractor shall submit, in addition to items listed in section 1.03(B), Contractor must also reference related sections such as sections listed in section 1.01 above, selective demolition, and other related project specific sections, etc., for any additional submittal requirements.
- E. For exports involving asphalt and/or concrete, first reference the asphalt and/or concrete hazmat survey report and the District's site demolition specifications. Should the asphalt contain asbestos, the asphalt shall go to an appropriate landfill. If the asphalt does not contain asbestos, the asphalt may go out as construction debris after District review and approval of the Export Request Form. Contractor shall provide a BOL and or weight tickets documenting haul-off from each load. In the absence of bill-of-ladings (BOLs) and weight tickets, a truck log may be used, showing the license plate number, time of departure, driver name and signature, etc. Refer to District for acceptable truck log format. Written approvals are required by the ECM, or their Designee, when the asphalt location is provided and the District's ECM or their Designee reviews the location and the laboratory data that confirms that the asphalt does not contain asbestos. See section 1.03(B).
- F. As mentioned in 1.03(B)(5), Contractor shall provide a waste acceptance letter from the receiving facility before the material is transported to the receiving landfill/recycling facility. The letter shall comply with the format that the District specifies and will not be approved otherwise. Waste material shall not be sent to any non-certified recycling facilities, private properties, family farms, construction sites at other school districts, or other educational institutions, etc.
- G. Soil reuse onsite, at other District sites, or at recycling facilities, shall only be deemed acceptable if approved by the District-hired Professional Geologist (PG) or Professional Engineer (PE) assigned to the project and health screening levels and/or hazardous levels have not been exceeded.
- H. Written documentation, in the form of a memo or e-mail from the Contractor to the Construction Manager, is required prior to export, verifying that the hauling contract specifies "clean" trucks and that the actual haul trucks utilized for export activities will be free of visible environmental impact (i.e., staining or discoloration) or deleterious materials.
- I. Written documentation is required confirming that the trucks traveled from the source location to the receiving facility location and that short loads were not augmented by other materials that were not tested as part of the final export activities. It is the Contractor's responsibility to document that no other trips or short load augmentation occurred and submit the documentation within **seven (7) calendar days** of the completion of the import/export activities. All export transportation activities shall be conducted in accordance with all applicable (local, State, Federal) rules and regulations.
- J. Should the Contractor decide to transport the waste via a method that does not produce tracking by the District's waste hauler, then the Contractor is responsible for preparing and drafting manifests for District review in addition to preparing and submitting a truck log. The truck log should match the weight tickets provided to the District for verification that the trucks arrived at the appropriate location. Contractor shall provide all weight tickets.
- K. Waste disposal or recycling certification documents are required per load, in the form of haul tickets, weight tickets, and either completed waste manifests or Bill of Ladings (if deemed appropriate by the ECM or their Designee). The documents must be approved

during the export request process, documenting the volume and recipient of all export materials and activities. Contractor shall provide, track, and maintain a log of all exported materials within (7) calendar days. This documentation shall be coordinated through the District, District's Construction Manager (CM), and District's Environmental Compliance Manager, or their Designee (ECM).

Specific Export Requirement:

- a. Prior to the export of material from a site, the Contractor must provide District "Export Materials Request Form" a minimum of **two (2) weeks** prior to the scheduled material export date along with a figure that shows the area where the export material will be coming from.
- b. Contractor shall hire the appropriately licensed contractor/waste hauler to transport export material based on the waste classification which shall first be determined by the Hazmat Oversight, Hazmat Survey, or District Environmental Consultant and confirmed with the District. The waste shall be separated, labeled, and documented as the highest Hazard class per the contents of each container. Provide documentation and submit for approval by the ECM. District will not allow mixing of Hazardous and Non-Hazardous Waste unless the designated Hazard Class is that of the Hazardous Waste and the receiving site will accept it as such.
- c. Contractor is responsible for finding acceptable permitted facilities for any exports deemed unusable at the target site (i.e., source site), environmentally impacted, contaminated, or of hazardous parameters such as a high pH, etc. The Contractor shall obtain the receiving facilities' waste profiling/waste acceptance requirements, and abide by facilities' requirements.
- d. Contractor shall provide to the District the receiving facilities' profiling and acceptance criteria so that the District's Environmental Consultant can perform the requisite testing based on requirements of the site or facility.
- e. The Environmental Compliance Manager (ECM), or their Designee, shall confirm that the proposed waste classification for any proposed export material is appropriate. Contractor shall provide to the Environmental Compliance Manager, or their Designee, information on the necessary waste manifest documentation no later than **14 calendar days** from the date of material/waste hauling from the District site to a permitted disposal facility.
- f. Contractor shall provide a waste acceptance letter referencing specific waste characterization information (e.g., laboratory report, pre-characterization report) to the District from the designated disposal facility prior to any export from the District's site confirming the export will not be sold and will remain onsite in perpetuity.
- g. Contractor must complete the appropriate waste manifest(s) or bill of lading and provide to the ECM for review prior to exporting, and provide a legible copy signed by the generator and transporter to be provided to the District Construction Manager for project records and to the ECM within 1 week from date of export or sooner. A legible copy of the manifest signed by the receiving site shall also be provided. A legible copy of the executed manifest or a bill of lading for each load shall be provided to the District, CM and ECM.
- h. Materials identified as hazardous waste will need the site US EPA waste generator identification number and transporter US EPA identification number. Hazardous waste manifests must be completely filled out with requisite generator and receiving facility information before signoff. All Hazardous Waste Manifests shall be signed by a DOT Hazmat certified individual. Any unapproved signing of District-

related Hazardous waste manifest may result in the Contractor taking all liability for costs related to the export.

- i. Non-hazardous waste manifests may be signed by the District CM team, but only with prior review and approval from the Environmental compliance Manager (ECM), or their Designee. Bill of Ladings must also be reviewed and approved by the Environmental Compliance Manager, or their Designee, prior to use.
- j. No third-party sale and/or brokering of excess material are permitted by the District including, but not limited to, transferring material from a District site to a non-District site.

1.04 APPROVALS

Export of soil, granular base, geotechnical grading, filling materials, boring sludge, asphalt/concrete, and impacted building materials (e.g., asbestos materials, lead painted materials, etc.) at District sites will occur ONLY with PRIOR approval of the Environmental Compliance Manager, or their Designee (ECM).

PART 2 – PRODUCTS

2.01 MATERIALS

A. Exported/Site Generated:

- 1. Soils: Soils proposed for export shall be tested pursuant to the requirements of 40 CFR (Code of Federal Regulations), CCR Title 22, and the intended receiving facility's acceptance criteria. (Note: Once soil or other materials for export have been tested, they cannot be **disturbed, added to, nor reused** for any purpose without prior approval by Environmental Compliance Manager, or their Designee.)
- 2. Gravels/Sands: Gravels, sands, or other natural rock materials shall not be exported from a District project site without prior testing by the Environmental Compliance Manager, or their Designee.
- 3. Concrete/Asphalt: Pre-tested, asphalt and concrete fragments shall be segregated and stockpiled separately. No soil shall be mixed in as a result of demolition or general construction activities. The onsite use of crushing equipment is not permitted unless first evaluated and approved by the Environmental Compliance Manager.
- 4. Miscellaneous Material: No miscellaneous material or other similar materials shall be exported from a District project site without prior evaluation, testing, and approval of the Environmental Compliance Manager, or their Designee. No crushed miscellaneous material containing concrete, asphalt, construction debris, or other potential deleterious materials that is generated onsite may be used as fill or grading material of any sort at a District project site.

PART 3 – EXECUTION

3.01 GRADING/EXCAVATION

- A. If the Contractor encounters an area(s) with discolored, stained, and/or odorous soils, or any other evidence of contamination during excavation/grading work, Contractor must immediately notify the District, Construction Manager, and Environmental Compliance Manager, or their Designee; cease work at the area(s); and secure the area(s) with fencing, tape, stakes, or other suitable means to prevent entry by personnel or construction equipment. Upon notification, the District will initiate a construction response to address the area(s) of concern, in accordance with pertinent regulatory requirements.

3.02 SAMPLING AND TESTING

- A. All export material testing will be performed by the District's third-party Environmental Consultant. Contractor must coordinate with the District per Item 1.03, of this Section, to request testing. Presumed Lead and Asbestos containing materials must be characterized and confirmed by the District's Hazardous Material Consultant before handling.
- B. Unless otherwise approved, export testing and certification process shall include the steps listed below. District retains the right to refuse exporting materials to any disposal facility.
 - 1. Stockpile all materials for sampling (standard stockpile or backhoe pothole stockpile). Materials generated by Contractor at a school site must be segregated by material type (e.g., separate stockpiles for concrete, asphalt, soil, etc.). Should any sludge result during construction, see section 1.03(C) for additional requirements.
 - 2. Place the stockpile materials ON plastic sheeting. Apply appropriate dust control measures to prevent dust generation from soil stockpiles; and be compliant with appropriate rules and regulations prescribed by the South Coast Air Quality Management District. Always maintain dust control measures and under all environmental conditions.
 - 3. DO NOT RELOCATE AND DO NOT ADD to a soil stockpile once sampled by the District's third-party Environmental Consultant. If the volume of the stockpile exceeds that of the volume indicated on the export request, a revised export request must be submitted with the new tonnage for review and approval.
 - 4. If a stockpile is generated from an area that does not have representative data (i.e., the area was not pre-characterized) then the District ECM must be notified immediately, to determine the timeframe in which the stockpile can be tested and reviewed or approved before export or reuse.
 - 5. Apply appropriate storm water pollution prevention best management practices (BMP's) on and around the developing stockpiles. Contractor generating stockpile shall be held fully responsible for any violation(s) arising out of non-compliance related to storm water pollution issues associated with the stockpile. Additionally, compliance with the California Statewide Construction General Permit (CGP) must be complied with as required.
 - 6. Confirm with the District that any asphalt or concrete has been tested before trenching and exporting.
 - 7. Provide completed Request for Export Material Testing form, per Item 1.03.A.
- C. The District's third-party Environmental Consultant shall perform the required tests and report results of all tests and shall furnish copies to the District, Construction Manager (CM), Environmental Compliance Manager, or their Designee (ECM), Project Inspector (PI), Architect, Contractor, DTSC (Department of Toxic Substance Control), and/or others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer or professional geologist and the material was tested in accordance with applicable requirements listed by the Contract Documents, CCR, CFR (Code of Federal Regulations), DTSC (Department of Toxic Substance Control), and DSA (Division of the State Architect).
- C. Export materials shall be stockpiled by Contractor and are deemed acceptable for export or reuse only when it is demonstrated to the satisfaction of Environmental Compliance Manager, or their Designee, that the subject materials meet the requirements of this Section.
- D. All export material shall be characterized, handled, and documented in accordance with applicable US EPA (United States Environmental Protection Agency) regulations, State of California hazardous waste and hazardous materials regulations, Department of Transportation (DOT) regulations, mitigation measures when applicable, and District requirements. For the purpose of this specification, "contaminated" shall mean any soil or material with contaminants of concern, which would require disposal at a permitted facility (i.e., California hazardous or RCRA hazardous). District Representative must be notified at least **five (5)** business days prior to the disposal of any

hazardous waste or hazardous material. No material disposal or reuse can take place without prior written approval of Environmental Compliance Manager, or their Designee.

3.03 TRANSPORTATION

- A. Haul Routes and Regulations/Restrictions: Contractor must comply with requirements of project environmental disclosure documents (e.g., CEQA (California Environmental Quality Act) EIR, ND, MND) and authorities having jurisdiction over the project area and the proposed activities (e.g., Regional Water Quality Control Board, DTSC (Department of Toxic Substance Control), DOT, etc.).
- B. At the District's discretion, excess material may be exported from one project site to another (within the District) depending upon material needs, material suitability; and MUST be approved by the Environmental Compliance Manager, or their Designee, as well as the District hired PG or District hired PE in writing.
- C. Any waste material needing to be disposed of at a permitted disposal facility MUST be transported by an appropriately licensed contractor/waste hauler. Hazardous and Non-Hazardous wastes must be separated into their own rigid containers before transporting. Otherwise, the waste with the highest hazard class shall be applied to the entire load.

3.04 COSTS

- A. District will pay for five (5) day turn-around-time, but we will reject anything less than 48 hours (or 2 business days). Contractor may submit for faster TAT, 3 or 4 business day TAT, but we may not be able to honor their request and if we can it will be at the Contractor's expenses.
- B. Contractor shall pay all fees associated with loading, hauling, and disposal of exported soil and aggregates with the exception of special, time restricted projects.
- C. Contractor shall pay for loading, hauling, disposal and/or processing of contaminated and/or hazardous soil and/or waste materials identified in the contract documents with the exception of special projects.
- D. In case of any violation(s) of the above-mentioned provisions outlined in this document, the Contractor must furnish a Release of Liability to the District, and will bear all financial burden arising from such violations. The Environmental Compliance Manager, or their Designee, possesses the sole discretion of rectifying the total inflicted costs, for which shall be solely borne by the Contractor.
- E. The District reserves the right to withhold payment and deny future exports until all requested export documents are provided to the District.

END OF DOCUMENT

DOCUMENT 01 45 29

TESTING LABORATORY SERVICES

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISION

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions, including “Tests and Inspections”; and
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any).

1.2. DOCUMENT INCLUDES

- 1.2.1. Observation and Supervision.
- 1.2.2. Testing Laboratories and Agencies
- 1.2.3. Tests and Inspections
- 1.2.4. Selection and Payment
- 1.2.5. District's Testing Laboratory Responsibilities
- 1.2.6. Laboratory reports.
- 1.2.7. Limits on testing laboratory authority.
- 1.2.8. Contractor responsibilities.
- 1.2.9. Schedule of inspections and tests.
- 1.2.10. Project Inspector's Access to Site

1.3. REFERENCES

- 1.3.1. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- 1.3.2. ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.
- 1.3.3. CBC - California Building Code.
- 1.3.4. Title 24, Parts 1 and 2, of the California Code of Regulations. Contractor shall keep a copy of these available at the job Site for ready reference during construction

- 1.3.5. DSA - Division of the State Architect, Office of Regulation Services, Structural Safety Section. DSA shall be notified at or before the start of construction.

1.4. OBSERVATION AND SUPERVISION

- 1.4.1. The District and Architect or their appointed representatives will review the Work and the Contractor shall provide facilities and access to the Work at all times as required to facilitate this review. Administration by the Architect and any consulting Structural Engineer will be in accordance with applicable regulations, including, without limitation, 24 C.C.R. § 4-341.
- 1.4.2. One or more Project Inspector(s) approved by DSA and employed by or in contract with the District("Project Inspector"), will observe the Work in accordance with 24 C.C.R. §§ 4-333(b) and 4-342:
- 1.4.3. Project Inspector shall have access to the Work wherever it is in preparation or progress for ascertaining that the Work is in accordance with the Contract Documents and all applicable code sections. Contractor shall provide facilities and access as required and shall provide assistance for sampling or measuring materials.
- 1.4.3.1. Project Inspector will notify District and Architect and inform Contractor of any observed failure of Work or material to conform to Contract Documents.
- 1.4.3.2. The Project Inspector shall observe and monitor all testing and inspection activities required.
- 1.4.4. Contractor shall conform with all applicable laws as indicated in the Contract Documents, including, without limitation, to 24 C.C.R. § 4-343. Contractor shall supervise and direct the Work and maintain a competent superintendent on the Project who is authorized to act in all matters pertaining to the Work. The Contractor shall inspect all materials, as they arrive, for compliance with the Contract Documents. Contractor shall reject defective Work or materials immediately upon delivery or failure of the Work or material to comply with the Contract Documents. The Contractor shall submit verified reports as indicated in the Contract Documents, including, without limitation, the Specifications and as required by 24 C.C.R. § 4-336.

1.5. TESTING LABORATORIES AND AGENCIES

- 1.5.1. Testing agencies and tests shall be in conformance with the Contract Documents and the requirements of 24 C.C.R. § 4-335.
- 1.5.2. Testing and inspection in connection with earthwork shall be under the direction of the District's consulting soils engineer ("Soils Engineer").
- 1.5.3. Testing and inspection of construction materials and workmanship shall be performed by a qualified laboratory ("Testing Laboratory" or "Laboratory"). The Testing Laboratory shall be under direction of an engineer registered in the State of California, shall conform to requirements of ASTM E329, and shall be employed by or in contract with the District.

1.6. TESTS AND INSPECTIONS

- 1.6.1. Contractor shall be responsible for notifying District and Project Inspector of all required tests and inspections. Contractor shall notify District and Project Inspector forty-eight (48) hours in advance of performing any Work requiring testing or inspection.
- 1.6.2. Contractor shall provide access to Work to be tested and furnish incidental labor, equipment, and facilities to facilitate all inspections and tests.
- 1.6.3. District will pay for first inspections and tests required by the Title 24 and other inspections or tests that District and/or Architect may direct to have made, including, but not limited to, the following principal items:
 - 1.6.3.1. Tests and observations for earthwork and pavings.
 - 1.6.3.2. Tests for concrete mix designs, including tests of trial batches.
 - 1.6.3.3. Tests and inspections for structural steel work.
 - 1.6.3.4. Field tests for framing lumber moisture content.
 - 1.6.3.5. Additional tests directed by District that establish that materials and installation comply with the Contract Documents.
 - 1.6.3.6. Test and observation of welding and expansion anchors.
 - 1.6.3.7. Factory observation of components and assembly of modular prefabrication structures and buildings.
- 1.6.4. District may at its discretion, pay and back charge Contractor for:
 - 1.6.4.1. Retests or reinspections, if required, and tests or inspection required due to Contractor error or lack of required identifications of material.
 - 1.6.4.2. Uncovering of work in accordance with Contract Documents.
 - 1.6.4.3. Testing done on weekends, holidays, and overtime will be chargeable to Contractor for the overtime portion.
 - 1.6.4.4. Testing done off site.
- 1.6.5. Testing and inspection reports and certifications:
 - 1.6.5.1. If initially received by Contractor, Contractor shall provide to each of the following a copy of the agency or laboratory report of each test or inspection or certification: District; Construction Manager, if any; Architect; Consulting Engineer, if any; Other Engineers on the Project, as appropriate; and; Project Inspector.
 - 1.6.5.2. When the test or inspection is one required by the Title 24, a copy of the report shall also be provided to the DSA.

1.7. SELECTION AND PAYMENT

- 1.7.1. District will hire and pay for services of an independent Testing Laboratory to perform specified inspection and testing as specified by District's Testing Laboratory.
- 1.7.2. District's hiring of Testing Laboratory shall in no way relieve Contractor of its obligation to perform work in accordance with requirements of Contract Documents.

1.8. DISTRICT'S TESTING LABORATORY RESPONSIBILITIES

- 1.8.1. Test samples of mixes submitted, as approved by Architect
- 1.8.2. Perform specified inspection, sampling, and testing of Products in accordance with specified standards.
- 1.8.3. Notify Architect and Contractor of observed irregularities or non-conformance of Work or Products.
- 1.8.4. Attend preconstruction conferences and progress meetings when requested by Architect.

1.9. LABORATORY REPORTS

- 1.9.1. After each inspection and test, District shall then submit one copy of laboratory report to Contractor. Reports of test results of materials and inspections found not to be in compliance with the requirements of the Contract Documents shall be forwarded immediately.
- 1.9.2. Each Testing Laboratory shall submit a verified report covering all of the tests which were required to be made by that agency during the progress of the Project. Such report shall be furnished each time that Work is suspended, covering the tests up to that time and at the Completion of the Project, covering all tests.

1.10. LIMITS ON TESTING LABORATORY AUTHORITY

- 1.10.1. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- 1.10.2. Laboratory may not approve or accept any portion of the Work.
- 1.10.3. Laboratory may not assume any duties of Contractor.
- 1.10.4. Laboratory has no authority to stop the Work.

1.11. CONTRACTOR RESPONSIBILITIES

- 1.11.1. Submit proposed items for testing as required herein and/or as further required in the Contract Documents to Architect for review in accordance with applicable specifications.
- 1.11.2. Cooperate with Laboratory personnel, and provide access to the Work and to manufacturer's facilities.
- 1.11.3. Notify Architect, District, and Testing Laboratory 48 hours prior to expected time for

operations requiring inspection and testing services.

- 1.11.4. When tests or inspections cannot be performed after such notice, reimburse District for Laboratory personnel and travel expenses incurred due to the Contractor's negligence.
- 1.11.5. Contractor shall notify District a sufficient time in advance of the manufacture of material to be supplied by Contractor pursuant to the Contract Documents, which must by terms of the Contract be tested, in order that the District may arrange for the testing of same at the source of supply. Sufficient notice for local source of supply, within 200 miles, requires a notification of no less than two (2) business days. Non-local, including out of state, must provide notification of no less than fifteen (15) business days.
 - 1.11.5.1. Any material shipped by the Contractor from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice that such testing and inspection will not be required shall not be incorporated in the Work.
- 1.11.6. Contract and pay for services of District's Testing Laboratory to perform additional inspections, sampling and testing required when initial tests indicate Contractor's work and/or materials does not comply with Contract Documents.

1.12. SCHEDULE OF INSPECTIONS AND TESTS

The Testing Laboratory shall perform tests and inspections for the following in conformance with the (CBC) California Building Code (International Building Code with State of California Amendments), California Code of Regulations, Title 24, Part 2:

- Structural Tests and Special Inspections (Chapter 17A)
 - Special Inspections (§ 1704A)
- Soils and Foundations (Chapter 18A)
 - Geotechnical Investigations (§ 1803A)
- Concrete (Chapter 19A)
 - Specifications for Tests and Materials
 - Concrete Quality, Mixing and Placing
 - Concrete Reinforcement and Anchor Testing Inspection (§ 1916A)
- Masonry (Chapter 21A)
 - Masonry Construction Materials (§ 2103A)
 - Masonry Quality (§ 2103A)
 - Quality Assurance (§ 2105A)
- Structural Steel (Chapter 22A)
 - Structural Steel (§ 2205A)
 - Identification & Protection of Steel for Structural Purposes (§ 2203A)
 - Inspection and Tests of Structural Steel (§ 2212A)
- Wood (Chapter 23)
 - Minimum Standards and Quality (§ 2303)
 - Wood Construction (§ 1704A.6)
- Exterior Walls (Chapter 14)
 - Masonry Units (§ 1404.4)
 - Masonry Construction Materials (§ 2103A)
 - Exterior Insulation and Finish Systems (§ 1408)
- Roof Assemblies and Roofing Structures (Chapter 15)
 - Materials (§ 1506)

- Aluminum (Chapter 20)
 - Materials (§ 2002.1)
 - Inspection (§ 2003.1)

1.12.1. **Plumbing**

Testing as specified in Division 15 including, but not limited to: Sterilization, soil waste and vent, water piping, source of water, gas piping, downspouts and storm drains.

1.12.2. **Automatic Fire Sprinklers (where applicable)**

Testing as specified in Division 15 shall include, but not be limited to: hydrostatic pressure.

1.12.3. **Heating, Ventilating and Air Conditioning**

Testing as specified in Division 15 shall include, but not be limited to: Ductwork tests, cooling tower tests, boiler tests, controls testing, piping tests, water and air systems, and test and balance of heating and air conditioning systems.

1.12.4. **Electrical**

Testing as specified in Division 16, including, but not limited to: Equipment testing, all electrical system operations, grounding system and checking insulation after cable is pulled.

1.13. **PROJECT INSPECTOR'S ACCESS TO SITE**

- 1.13.1. A Project Inspector employed by the District in accordance with the requirement of State of California Code of Regulations, Title 24, Part 1 will be assigned to the Work. Project Inspector's duties are specifically defined in 24. C.C.R. §4-342, and as indicated in the General Conditions.
- 1.13.2. District and Construction Manager shall at all times have access for the purpose of inspection to all parts of the Work and to the shops wherein the Work is in preparation, and Contractor shall at all times maintain proper facilities and provide safe access for such inspection.
- 1.13.3. The Work in all stages of progress shall be subject to the personal continuous observation of the Inspector. Inspector shall have free access to any or all parts of the Work at any time. Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep Inspector fully informed respecting the progress and manner of the Work and the character of the materials. Inspection of the Work shall not relieve the Contractor from any obligation set forth in the Contract Documents.
- 1.13.4. The Inspector is not authorized to change, revoke, alter, enlarge or decrease in any way any requirement of the Contract Documents, drawings, specifications or subsequent change orders.
- 1.13.5. Whenever there is insufficient evidence of compliance with any of the provisions of Title 24 or evidence that any material or construction does not conform to the requirements of Title 24, the Division of the State Architect may require tests as proof of compliance. Test methods shall be as specified herein or by other recognized and accepted test

methods determined by the Division of the State Architect. All tests shall be performed by a testing laboratory accepted by the Division of the State Architect.

END OF DOCUMENT

DOCUMENT 01 50 00

TEMPORARY FACILITIES AND CONTROLS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. 01 52 10 Site Standards; and

1.2. TEMPORARY UTILITIES

1.2.1. Electric Power and Lighting:

- 1.2.1.1. Contractor will provide and pay for power during the course of the work to the extent power is not in the building(s) or on the Site. Contractor shall be responsible for providing temporary facilities required on the Site to point of intended use.
- 1.2.1.2. Contractor shall provide, wire for, install, and maintain temporary electrical lights wherever it is necessary to provide illumination for the proper performance and/or observation of the Work: a minimum of 20 foot-candles for rough work and 50 foot-candles for finish work.
- 1.2.1.3. Contractor shall provide, wire for, install, and maintain temporary electrical to maintain in operating condition all fire alarm devices/system, public address/safety devices/systems, security/camera devices/system as well as IDF's and MDF's .
- 1.2.1.4. Contractor shall be responsible for maintaining existing lighting levels in the Project vicinity should temporary outages or service interruptions occur.

1.2.2. Heat and Ventilation:

- 1.2.2.1. Contractor shall provide temporary HVAC to maintain environmental conditions to facilitate progress of the Work, to maintain conditioned air to existing electrical and IT equipment, to meet specified minimum conditions for the installation and curing of materials, and to protect materials and finishes from damage due to improper temperature and humidity conditions. Portable HVAC equipment shall be standard units complete with controls.

1.2.2.2. Contractor shall provide forced ventilation and dehumidification, or other as required, of enclosed areas for proper installation and curing of materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors, and gases.

1.2.2.3. Contractor shall pay the costs of installation, maintenance, operation, and removal of temporary HVAC, including costs for fuel consumed, required for the performance of the Work.

1.2.3. **Water:**

1.2.3.1. Contractor will provide and pay for water during the course of the work. Contractor shall be responsible for providing temporary facilities required.

1.2.3.2. Contractor shall make potable water available for human consumption.

1.2.4. **Sanitary Facilities:**

1.2.4.1. Contractor shall provide sanitary temporary facilities in no fewer numbers than required by law and such additional facilities as may be directed by the District for the use of all workers. The facilities shall be maintained in a sanitary condition at all times and shall be left at the Site until removal is directed by the District or Contractor completes all Work.

1.2.4.2. Use of toilet facilities in the Site shall not be permitted except by consent of the Project Inspector and District.

1.2.5. **Internet Service:**

1.2.5.1. Contractor shall arrange with local internet service provider for business internet service for the performance of the Work. Contractor shall, at a minimum, provide one dedicated business line for internet. Internet speed shall be 100/100 mbps, or faster, and WiFi speed specification shall utilize 802.11AC IEE standard or better.

1.2.5.2. Contractor shall pay the costs for telephone and/or internet installation, maintenance, service, and removal; for Construction Site Office, Construction Manager's Office and Inspector's Office.

1.2.6. **Fire Protection:**

1.2.6.1. Contractor shall provide and maintain fire extinguishers and other equipment for fire protection. Such equipment shall be designated for use for fire protection only and shall comply with all requirements of the California Fire, State Fire Marshall and/or its designee.

1.2.6.2. Where on-site welding and burning of steel is unavoidable, Contractor shall provide protection for adjacent surfaces.

1.2.7. **Trash Removal:**

1.2.7.1. Contractor shall provide trash removal on a timely basis, no less than weekly,

from all Site Offices and throughout the Site.

1.2.8. Temporary Facilities

1.2.8.1. Contractor shall provide sufficient space and facilities for its own force's needs.

1.2.8.2. Contractor shall coordinate floor plan and location of electrical, telephone, data outlets with District prior to ordering and delivering the trailer.

1.2.8.3. In addition, unless otherwise indicated in the Contract Documents, Contractor shall provide, install, set-up and/or position, the following facilities, trailers, offices, furniture and services for the exclusive use by the District. At project completion, confirm if purchased items are to be returned to the District:

1.2.8.3.1. Basic services: fixed line for high speed internet service.

1.2.8.3.2. District Field Office: The Contractor shall provide one (1) field office trailer, equipped with standard HVAC, a minimum of 12' x 60', that includes one (1) conference room, two (2) separate offices, and one (1) single compartment all gender restroom. Provide operable security screens at trailer windows and security bars at trailer doors.

1.2.8.3.3. Restroom to be provided within trailer. Restroom to have temporary potable water and sewer service (storage tank) for life of project. Restroom to be serviced, cleaned and pumped along with Contractor portable restrooms (porta-potty). Contractor shall keep the restroom fully stocked with soap, toilet paper and paper towels, as needed but no less than weekly.

1.2.8.3.4. District field office trailer shall be furnished with one (1) conference table that seats up to twelve (12). Provide eight (8) padded meeting chairs, Global or equal.

1.2.8.3.5. Per office: Provide one (1) rolling mid-back task chair, with arms; one (1) double pedestal metal desk, 29" x 72" x 36", HON or equal ; one (1) metal bookcase, three shelf, 41"x34"x12"; four (4) drawers, legal size lateral files, HON 500 series or equal; two (2) "Brookside Design Premium Blueprint Pivot Wall Rack, Model Number: WRWH" wall-mounted with 12 hangers, or equal;

1.2.8.3.6. Per meeting/conference area: Provide one (1) metal bookcases, three shelf, 41"x34"x12"; one (1) large marker board, 48" x 72"; one (1) resin folding table 29"H x 30"W x72"L.

1.2.8.3.7. Per meeting/Conference area: Provide one (1) 55" wifi TV. See District Technology and Information Services Buy List: <https://www.lbschools.net/departments/tisb/what-to-buy>

- 1.2.8.3.8. Per meeting/conference area: Provide one (1) wifi capable, “all-in-one” copier, printer, and scanner, such as Konica Minolta bizhub C250, or Approved Equal. “All-in-one” capable of copying, printing, and scanning in black and white and color; in letter, legal, ledger paper sizes, with full duplex; maintenance plan to include paper, toner, and all other supplies needed for the life of the project.
- 1.2.8.3.9. Provide one (1) mini fridge (fridge/freezer combo) and one (1) microwave

1.3. CONSTRUCTION AIDS

1.3.1. Plant and Equipment:

- 1.3.1.1. Contractor shall furnish, operate, and maintain a complete plant for fabricating, handling, conveying, installing, and erecting materials and equipment; and for conveyances for transporting workmen. Include elevators, hoists, debris chutes, and other equipment, tools, and appliances necessary for performance of the Work.
- 1.3.1.2. Contractor shall maintain plant and equipment in safe and efficient operating condition. Damages due to defective plant and equipment, and uses made thereof, shall be repaired by Contractor at no expense to the District.

- 1.3.2. No District tools or equipment shall be used by Contractor or its subcontractors for the performance of the Work.

1.4. BARRIERS AND ENCLOSURES

- 1.4.1. Contractor shall obtain District's written permission for locations and types of temporary barriers and enclosures, including fire-rated materials proposed for use, prior to their installation.
- 1.4.2. Contractor shall provide a six (6) foot high, chain link perimeter fence with posts driven into the ground and fabric screen as a temporary barrier around construction area. Contractor shall provide and maintain temporary enclosures to prevent public entry and to protect persons using other buildings and portions of the Site and/or Premises. Contractor shall remove temporary fence, barriers, and enclosure upon Completion of the Work. If irrigation system is broken by Contractor or its subcontractors, the system must be repaired at the Contractor's cost by a District preapproved irrigation contractor.
- 1.4.3. Contractor shall provide site access to existing facilities for persons using other buildings and portions of the Site, for the public, and for deliveries and other services and activities.
- 1.4.4. Contractor shall provide access to District representatives for purposes of surveying, evaluating, servicing, maintaining, or repairing those areas not included in the Work or under control by the Contractor.

1.5. SECURITY

- 1.5.1 Contractor shall secure all construction equipment, machinery and vehicles, park, and store only within fenced area, and render inoperable during non-work hours. Contractor is responsible for ensuring that no construction materials, tools, equipment, machinery, or vehicles can be used for unauthorized entry or other damage or interference to activities and security of existing facilities adjacent to and in the vicinity of the Project Site. Refer to Owner Controlled Insurance Program (OCIP) Manual and Safety Standards for additional requirements.

1.6. TEMPORARY CONTROLS

1.6.1. Noise Control

- 1.6.1.1. Contractor acknowledges that adjacent facilities may remain in operation during all or a portion of the Work, and Contractor shall take all reasonable precautions to minimize noise as required by applicable laws and the Contract Documents. Additional noise consideration may be requested during special events such as, but not limited to required testing, assemblies, or graduation ceremonies.

- 1.6.1.2. Notice of proposed noisy operations, including without limitation, operation of pneumatic demolition tools, concrete saws, and other equipment, shall be submitted to District a minimum of forty-eight (48) hours in advance of their performance.

1.6.2. Noise and Vibration

- 1.6.2.1. Equipment and impact tools shall have intake and exhaust mufflers.

- 1.6.2.2. Contractor shall cooperate with District to minimize and/or cease the use of noisy and vibratory equipment if that equipment becomes objectionable by its longevity.

1.6.3. Dust and Dirt

- 1.6.3.1. Contractor shall conduct demolition and construction operations to minimize the generation of dust and dirt and prevent dust and dirt from interfering with the progress of the Work and from accumulating in the Work and adjacent areas including, without limitation, occupied facilities.

- 1.6.3.2. Contractor shall periodically water exterior demolition and construction areas to minimize the generation of dust and dirt.

- 1.6.3.3. Contractor shall ensure that all hauling equipment and trucks carrying loads of soil and debris shall have their loads sprayed with water or covered with tarpaulins, and as otherwise required by local and state ordinance.

- 1.6.3.4. Contractor shall prevent dust and dirt from accumulating on walks, roadways, parking areas, and planting, and from washing into sewer and storm drain lines.

1.6.4. Surface and Subsurface Water

- 1.6.4.1. Contractor shall not permit surface and subsurface water, and other liquids, to

accumulate in or about the vicinity of the Premises. Should accumulation develop, Contractor shall control the water or other liquid, and suitably dispose of it by means of temporary pumps, piping, drainage lines, troughs, ditches, dams, or other methods.

1.6.5. Pollution

- 1.6.5.1. No burning of refuse, debris, or other materials shall be permitted on or near the Premises.
- 1.6.5.2. Contractor shall comply with applicable regulatory requirements and anti-pollution ordinances during the conduct of Work including, without limitation, demolition, construction, and disposal operations.

1.6.6. Construction and Demolition Waste Management

- 1.6.6.1. Comply with state, county and/or local requirements, whichever is the most stringent, for waste removal including diversion of construction waste and demolition.
- 1.6.6.2. Submit Construction Waste Management Plan (District form) for District review and approval within ten (10) calendar days of Notice to Proceed and prior to any waste removal.
- 1.6.6.3. Submit Construction Waste Management Progress Report on District form, monthly with Application for Payment, or upon request from the District.

1.6.7. Lighting

- 1.6.7.1. If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

1.7. LOW VOLTAGE EQUIPMENT PROTECTION

- 1.7.1. Main Distribution Frame (MDF), Intermediate Distribution Frame (IDF), Intercom Clock/Speaker System (ICS), Electronic Visitors Screening System (EVSS), Intrusion Detection System (IDS) and Telephone Switch protection guidelines.

1.7.1.1. Prior to Start of Construction:

- 1.7.1.1.1. Contractor to contact District Facilities Technology Group (FTG) personnel to review and document existing equipment existing room conditions.
- 1.7.1.1.2. Contractor to take pictures of existing conditions.
- 1.7.1.1.3. Contractor to create plan to protect equipment based on equipment location

1.7.1.2. When Equipment is in a Large Open Space:

- 1.7.1.2.1. Contractor to provide a dust free environment during

construction.

1.7.1.2.2. Contractor to provide an enclosure around equipment.

1.7.1.2.3. Equipment in enclosure should be easily accessible during construction.

1.7.1.2.4. Contractor to protect equipment from construction debris, dust, and overspray of texture and paint.

1.7.1.2.5. Contractor to provide an air recirculating system to remove hot air and protect equipment from overheating such as 1472 CFM Classic Advanced Whole House Fan or Approved Equal.

1.7.1.3. When Equipment is in its own Isolated Room:

1.7.1.3.1. Contractor to provide a dust free environment during construction.

1.7.1.3.2. Contractor to provide a barrier zipper door for District personnel access.

1.7.1.3.3. Contractor to provide sandbags or equal at bottom of barrier to create a seal to prevent dust from entering room.

1.7.1.3.4. Contractor to provide an air recirculating system to remove hot air and protect equipment from overheating such as 1472 CFM Classic Advanced Whole House Fan or Approved Equal.

1.7.1.4. When Equipment is Required to Remain "ON" During Construction:

1.7.1.4.1. Contractor to identify electrical panel and circuit serving the equipment.

1.7.1.4.2. Contractor to provide a lock-on device on circuit to protect from accidental shutoff.

1.7.1.5. When Equipment is Not Required to Remain "ON" During Construction:

1.7.1.5.1. Contractor to contact District Facilities Technology personnel to assist with shutdown.

1.7.1.5.2. Contractor to wrap equipment in plastic to protect from construction debris, dust and overspray of texture and paint.

1.7.1.6. During construction:

1.7.1.6.1. Contractor to maintain a dust free environment.

1.7.1.6.2. Contractor to visually inspect room conditions on a weekly basis.

- 1.7.1.6.3. Contractor to inspect air filters if any and change them out as needed.
- 1.7.1.6.4. Contractor to remove any accumulated dust during construction.
- 1.7.1.6.5. Contractor to provide and use a static free vacuum when cleaning equipment.
- 1.7.1.6.6. Contractor to install preventive measures to protect equipment from any moisture or water damage.

1.7.1.7. Utilities Shutdown:

- 1.7.1.7.1. Contractor to submit a Notification for Utilities Shutdown Request **5 business days** before turning off power to any Low Voltage system.

1.8. JOB SIGN(S)

1.8.1. General

- 1.8.1.1. Contractor shall provide, install and maintain, at Contractor's expense, one (1) Project Identification sign with the materials, size, design, text, colors and location to be approved in advance by the District. Artwork and layout for the sign will be provided by the Architect. Contact the District for Job Site Sign Guidelines Template.
- 1.8.1.2. Signs other than the specified Project sign, District provided and installed banners, and/or signs required by law, for safety, or for egress, shall not be permitted, unless otherwise approved in advance by the District.

1.8.2. Materials:

- 1.8.2.1. Structure and Framing: Structurally sound, new or used wood or metal; wood shall be nominal 3/4-inch exterior grade plywood. Support posts, if utilized, should be 4-inch by 4-inch.
- 1.8.2.2. Sign Surface: Minimum 3/4-inch exterior grade plywood.
- 1.8.2.3. Rough Hardware: Galvanized.
- 1.8.2.4. Paint: Exterior quality, type and colors selected by the District and/or the Architect.

1.8.3. Fabrication:

- 1.8.3.1. Contractor shall fabricate to provide smooth, even surface for painting.
- 1.8.3.2. Size: 4'-0" t x 8'-0" w, unless otherwise indicated.
- 1.8.3.3. Contractor shall paint exposed surfaces of supports, framing, and surface

material with exterior grade paint: one coat of primer and one coat of finish paint.

1.8.3.4. Text and Graphics: As indicated. The following shall be included on the sign:

- 1.8.3.4.1. Owner: Long Beach Unified School District
- 1.8.3.4.2. Poly High School
- 1.8.3.4.3. Name of LBUUSD School Superintendent (confirm with AOR)
- 1.8.3.4.4. Names of LBUUSD Board of Education (confirm with AOR)
- 1.8.3.4.5. PBK Architects
- 1.8.3.4.6. Name of Contractor
- 1.8.3.4.7. Source of Funding: "Your School Bond Funds at Work"
- 1.8.3.4.8. Projected Completion
- 1.8.3.4.9. Bond Program Office Contact Information

1.8.4. **Installation:**

1.8.4.1. Contractor to install Project sign within **60** days from Notice to Proceed.

1.8.4.2. Contractor to remove and relocate the Project sign, if needed, due to phasing/access/etc., in order for progress of the work.

1.8.4.3. Contractor to remove the Project sign at Completion of the contract or within 30 days of occupancy (if phased, occupancy of all buildings). Contractor to restore surface and remove all sign debris off-site.

1.8.4.4. Contractor to mount sign on posts with appropriate bracing, stakes, and other materials (including but not limited to bolts, plates) to properly secure and/or maintain erect on site with locations approved in advance by the District. Do not use concrete.

1.9. **PUBLICITY RELEASES**

1.9.1. Contractor shall not release any information, story, photograph, plan, or drawing relating to information about the Project to anyone, including press and other public communications medium, including, without limitation, on website(s).

END OF DOCUMENT

DOCUMENT 01 52 10

SITE STANDARDS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS:

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions, including without limitation, Site Access, Conditions, and Regulations;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. Drug-Free Workplace Certification;
- 1.1.5. Tobacco-Free Environment Certification;
- 1.1.6. Criminal Background Investigation/Fingerprinting Certification; and
- 1.1.7. 01 50 00 Temporary Facilities and Controls.

1.2. REQUIREMENTS OF THE DISTRICT

1.2.1. Drug-Free Schools and Safety Requirements:

- 1.2.1.1. All school sites and other District Facilities have been declared "Drug-Free Zones." No drugs, alcohol, smoking or the use of tobacco products are allowed at any time in any buildings, Contractor-owned vehicles or vehicles owned by others while on District property. No students, staff, visitors, or contractors are to use drugs on these sites.
- 1.2.1.2. Contractor shall post: "Non-Smoking Area" in a highly visible location on Site. 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 must be kept clean at all times.
- 1.2.1.3. 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.
- 1.2.2. **Language:** Unacceptable and/or loud language will not be tolerated, "Cat calls" or other derogatory language toward students or public will not be allowed.
- 1.2.3. **Disturbing the Peace (Noise and Lighting):**

- 1.2.3.1. 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.
- 1.2.3.2. 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 handheld communication radios.
- 1.2.3.3. If portable lights are used after dark, the lights must be located so as not to direct light into neighboring properties.

1.2.4. Traffic:

- 1.2.4.1. 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.
- 1.2.4.2. 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.
- 1.2.4.3. 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.
- 1.2.4.4. Parking areas shall be reviewed and approved by District in advance. No parking is to occur under the drip line of trees or in areas that could otherwise be damaged.
- 1.2.4.5. 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.

END OF DOCUMENT

SECTION 01 57 13 EROSION CONTROL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Scope of Work:
 - 1. General: Provide all materials, equipment and labor necessary to furnish and install straw wattles at locations shown on the Drawings and on Contractors Storm Water Pollution Prevention Plan.
 - 2. Storm Water Pollution Prevention Plan:
 - a. The Contractor shall as a minimum address:
 - 1) Cut and fill operations.
 - 2) Temporary stockpiles.
 - 3) Vehicle and equipment storage, maintenance and fueling operations.
 - 4) Concrete, plaster, mortar and paint disposal.
 - 5) Dust control.
 - 6) Tracking of dirt, mud on off-site streets.
 - 7) Erosion Controls
 - 8) Sediment Controls

1.3 QUALITY ASSURANCE

- A. General: Comply with governing codes and regulations.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Straw Wattles: Shall be new manufactured straw roles in compliance with state requirements for sediment control.
- B. Filter Bag: Shall be as required by local jurisdiction.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Straw Wattles: Shall be installed as required.
- B. Filter Bags: Shall be installed as required by manufacturer's requirements.

3.2 MAINTENANCE AND REMOVAL

- A. General: Maintain and repair existing and new erosion control facilities throughout the construction period. Remove silt build up at straw wattles and/or silt fences as needed. Repair damage to earth slopes and banks. Erosion control measures shall be left in place

until final paving and landscaping are complete.

- B. Monitoring: Contractor shall provide all site monitoring and recommendations to meet current NPDES requirements during construction.
- C. Cleaning: Keep area clean of debris.
- D. Remove erosion control measures prior to placing finish landscaping.

END OF SECTION 01 57 13

SECTION 01 57 23 STORM WATER POLLUTION PREVENTION PLAN

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Work in this section includes furnishing all labor, equipment and materials necessary for the implementation, maintenance, monitoring, and reporting as required by the OWNER-provided Storm Water Pollution Prevention Plan (SWPPP) and the Construction General Permit.
- B. This is a Risk Level 1 Traditional Construction project.
- C. OWNER will provide
 - 1. Project SWPPP, prepared and certified by a Qualified SWPPP Developer (QSD)
- D. The contractor shall provide:
 - 2. Qualified SWPPP Practitioner (QSP) to oversee permit compliance during construction.
 - 3. QSD if SWPPP amendments are required
 - 4. Water Pollution Control Manager (WPCM)
- E. Principal items of work include:
 - 5. SWPPP administration and maintenance
 - 6. Training employees and subcontractors in stormwater Best Management Practices (BMPs)
 - 7. Stormwater site inspections
 - 8. Stormwater sampling and numeric analysis if the project is Risk Level 2 or 3.
 - 9. Reporting and recordkeeping
 - 10. Implementing and maintaining BMPs, and removing BMPs when no longer needed.
 - 11. Non-stormwater management and good housekeeping practices
 - 12. Final site cleanup and SWPPP close-out

1.2 REFERENCES

- A. Project SWPPP
- B. Construction General Permit: "Storm Water Discharges Associated with Construction and Land Disturbance Activities," SWRCB Order No. 2009-0009-DWQ, NPDES General Permit No. CAS000002, with amendments 2010-0014-DWQ and 2012-0006-DWQ
- C. Construction Site Best Management Practices Manual (BMP Manual), State of California, Department of Transportation (Caltrans), 2024 edition

1.3 QUALITY ASSURANCE

- A. Qualified SWPPP Practitioner (QSP) shall hold a current QSD or QSP certification from the State of California / CASQA.
- B. Qualified SWPPP Developer (QSD) shall hold a current QSD certification from the State of California / CASQA.
- C. Water Pollution Control Manager (WPCM) shall be appropriately trained and thoroughly familiar with the project SWPPP and Construction General Permit. The WPCM is

responsible for overseeing the implementation of the SWPPP on a day-to-day basis. The WPCM shall be an employee of the Contractor and shall be on site regularly.

- D. The WPCM shall educate, direct and enforce compliance with the requirements of the SWPPP by all employees and subcontractors.
- E. All contractor employees, subcontractors, and heavy equipment operators shall attend a pre-construction water pollution control training session conducted by the Contractor's WPCM.

1.4 GENERAL PERFORMANCE REQUIREMENTS

- A. All storm water and non-storm water discharges shall be in compliance with all applicable federal, state, and local requirements.
- B. This Section and the SWPPP outline the contract minimum requirements, and do not relieve the Contractor of his responsibilities for protection of water quality in accordance with all federal, state, and local requirements.
- C. Additional BMPs shall be required if the BMPs which are utilized are not adequately protecting water quality.
- D. The Contractor shall update the Water Pollution Control Drawings to indicate current operations, equipment used, sequence of work, and other aspects of the project.
- E. Contractor and all subcontractors shall be thoroughly familiar with all of the requirements of the SWPPP and Construction General Permit. Contractor is responsible for the performance of subcontractors. Contractor's WPCM shall inspect and monitor all subcontractors' work and storage areas for compliance with this Section.

1.5 FINES AND PENALTIES

- A. Contractor shall pay any fines and be liable for any other penalties that may be imposed by any federal, state, or local regulatory agency for non-compliance with any water quality requirement during the course of work.
- B. Contractor is responsible for implementing any and all BMP corrective measures, at his own expense, as may be directed by the regulatory agencies.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Provide all temporary and permanent water pollution control measures, equipment and materials as required by this Section and the Construction Drawings.
- B. Materials shall conform to the Caltrans Standard Specifications and Caltrans Standard Plans including Standard Specifications sections:
 - 1. 13-4 Job Site Management
 - 2. 13-5 Temporary Soil Stabilization
 - 3. 13-6 Temporary Sediment Control
 - 4. 13-7 Temporary Tracking Control
 - 5. 13-8 Temporary Active Treatment System
 - 6. 13-9 Temporary Concrete Washouts
 - 7. 13-10 Temporary Linear Sediment Barriers

- 8. 14-9 Air Quality
- 9. 14-10 Solid Waste Disposal and Recycling
- 10. 14-11 Hazardous Waste and Contamination

PART 3 – EXECUTION

3.1 GENERAL

- A. Complete all required information in the SWPPP, to identify the first proposed stage of construction, and to identify personnel involved in WPC work.
- B. Provide documentation for WPCM, employee and subcontractor training, including pre-construction BMP training.
- C. The Contractor's WPCM shall maintain the field-copy SWPPP up-to-date throughout Construction.

3.2 MONITORING, INSPECTIONS AND REPORTING

- A. Contractor's WPCM shall:
 - 1. Conduct daily inspections of adjoining public roadways, material storage areas, and vehicle and equipment areas
- B. Contractor's QSP shall:
 - 1. Monitor the National Weather Service (NWS) forecast on a daily basis.
 - 2. Conduct inspections:
 - a. Within 72 hours prior to predicted rain events to ensure that the site is prepared for the rain event
 - b. At 24-hour intervals during Potential QREs
 - c. Within 48 hours after each QRE
 - 3. Prepare and submit:
 - a. Weekly BMP Inspection Reports
 - a. Quarterly Non-Stormwater Inspection Reports
 - b. Pre-Rain Event BMP Inspection Reports
 - c. During-rain event Inspection Reports
 - d. Post-Rain Event Inspection Reports
 - e. NAL Exceedance Reports and NEL Violation Reports, if required
 - f. Annual Reports
 - g. Site map and photographs required for the Notice of Termination application.
 - 4. Develop and implement REAPs if project is Risk Level 2 or 3.
 - 5. Serve as OWNER's Data Submitter for document submission on the SMARTS website
 - 6. Generally assist the OWNER in filing reports on the SMARTS website
- C. All reports shall be in a format acceptable to OWNER. Reports shall be submitted within one week of the inspection.
- D. Implement identified corrective actions within 72 hours, unless a later date is authorized.

- E. Notify the OWNER of any site visits by or correspondence received from any federal, state, or local agency, which are related to activities under this Section.

3.3 BEST MANAGEMENT PRACTICES

- A. Implement Best Management Practices as required by Sections 13 and 14 of the Caltrans Standard Specifications.
- B. Work shall comply with the following Caltrans Standard Specifications Sections, as applicable:
 - 1. 13-4 Job Site Management
 - 2. 13-5 Temporary Soil Stabilization
 - 3. 13-6 Temporary Sediment Control
 - 4. 13-7 Temporary Tracking Control
 - 5. 13-8 Temporary Active Treatment System
 - 6. 13-9 Temporary Concrete Washouts
 - 7. 13-10 Temporary Linear Sediment Barriers
 - 8. 14-9 Air Quality
 - 9. 14-10 Solid Waste Disposal and Recycling
 - 10. 14-11 Hazardous Waste and Contamination
- C. Best Management Practices shall be implemented concurrent with the commencement of construction, shall be maintained throughout construction, and shall be removed when no longer required.

3.4 COMPLETION OF WORK

- A. Final site cleanup and stabilization shall be considered complete when all of the following have been achieved:
 - 1. The site will not pose any additional sediment discharge risk than it did prior to the commencement of construction activity;
 - 2. There is no potential for construction-related storm water pollutants to be discharged into site runoff;
 - 3. Final stabilization has been reached;
 - 4. Construction materials and wastes have been disposed of properly;
 - 5. Post-construction storm water management measures have been installed;
 - 6. All construction-related equipment, materials and any temporary BMPs no longer needed are removed from the site.
- B. Final stabilization shall be determined by one of the following methods:
 - 1. 70% of the disturbed soil on each individual parcel is uniformly covered by live, actively growing plant matter in contact with the soil;
 - 2. Alternately, 70% of the disturbed soil on each individual parcel may be uniformly covered in another manner acceptable to the Engineer and the RWQCB.
 - 3. RUSLE or RUSLE2 method, as outlined in the Permit; computational proof is required;
 - 4. A custom method. The Contractor shall demonstrate compliance with the final stabilization requirements in the Permit, in some other manner than a or b, above.

5. At completion of work Contractor and Owner shall inspect the site, and Contractor shall present the currently implemented SWPPP with all backup records to the Owner.

END OF SECTION 01 57 23

DOCUMENT 01 60 00

MATERIALS AND EQUIPMENT

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions.
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any); and
- 1.1.4. Imported Materials Certification.
- 1.1.5. 01 25 10 Product Options and Substitutions

1.2. MATERIALS AND EQUIPMENT

- 1.2.1. Only items approved by the District and/or Architect shall be used.
- 1.2.2. Contractor shall submit lists of Products and other Product information in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

1.3. MATERIALS AND EQUIPMENT COLORS

- 1.3.1. The Contractor shall comply with all schedule(s) of colors provided by the District and/or Architect.
- 1.3.2. 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.
- 1.3.3. Contractor shall request priority in writing for any item requiring advance ordering to maintain the approved Construction Schedule.

1.4. DELIVERY, STORAGE, AND HANDLING

- 1.4.1. Contractor shall deliver manufactured materials in original packages, containers, or bundles (with seals unbroken), bearing name or identification mark of manufacturer. District may inspect materials prior to Contractor unloading the delivered materials. District may reject any materials that do not conform to the Contract Documents.

- 1.4.2. 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.
- 1.4.3. 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.
- 1.4.4. Materials 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 are not acceptable.
- 1.4.5. Contractor shall store materials so as to cause no obstructions of sidewalks, roadways, or underground services. Contractor shall protect materials and equipment furnished pursuant to the Contract Documents.
- 1.4.6. Contractor may store materials on Site with prior written approval by District; all materials 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 no cost to District.
- 1.4.7. When any room in Project is used as a shop or storeroom, 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.

2. PRODUCTS

2.1. MANUFACTURERS

- 2.1.1. Manufacturers listed in various sections of the Contract Documents were used for the basis of design.
- 2.1.2. The listing of a manufacturer does not imply that every product of that manufacturer is acceptable or as meeting the requirements of the Contract Documents.

2.2. FACILITIES AND EQUIPMENT

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

2.3. MATERIALS REFERENCE STANDARDS

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

3. EXECUTION

3.1. WORKMANSHIP

- 3.1.1. 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).
- 3.1.2. Work shall be executed by tradespersons skilled in their respective field of work. When completed, parts shall have been durably and substantially built and present a neat appearance.

3.2. COORDINATION

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

3.3. 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 a manner to ensure well-balanced performance, in accordance with manufacturer's recommendations and in accordance with Contract Documents. For example, electric water coolers require water, electricity, and drain services; roof drains require drain systems; 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," and "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.

3.4. APPROVED INSTALLER OR APPLICATOR

Contractor shall ensure that all installations are only performed by a manufacturer's approved installer or applicator.

3.5. MANUFACTURER'S RECOMMENDATIONS

All installations shall be in accordance with manufacturer's published recommendations and specific written directions of manufacturer's representative. Should the Contract Documents differ from recommendations of manufacturer or directions of manufacturer's 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

DOCUMENT 01 66 10

DELIVERY, STORAGE AND HANDLING

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions, including, without limitation, Site Access, Conditions and Requirements; and
- 1.1.2. Special Conditions.

1.2. PRODUCTS

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

1.3. TRANSPORTATION AND HANDLING

- 1.3.1. Contractor shall transport and handle Products in accordance with manufacturer's instructions.
- 1.3.2. Contractor shall promptly inspect shipments to confirm that Products comply with Contract requirements, are of correct quantity, and are undamaged.
- 1.3.3. Contractor shall provide equipment and personnel to properly handle Products to prevent soiling, disfigurement, or damage.

1.4. STORAGE AND PROTECTION

- 1.4.1. 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.
- 1.4.2. Contractor shall place fabricated Products that are stored outside, on above-ground sloped supports.
- 1.4.3. Contractor shall provide off-site storage and protection for Products when Site does not permit on-site storage or protection.
- 1.4.4. Contractor shall cover Products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.

- 1.4.5. Contractor shall store loose granular materials on solid flat surfaces in a well-drained area and prevent mixing with foreign matter.
- 1.4.6. Contractor shall provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- 1.4.7. 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.

END OF DOCUMENT

SECTION 01 71 23 FIELD ENGINEERING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Layout of the Work.
 - 2. Verification of Work:
 - a. Owner reserves the right to verify any Work that Inspector deems necessary.
 - b. Other Sections that require surveyor to verify or measure installed Work and related item: Surveyor shall perform such verifications or measurements at Contractor's expense. Contractor shall furnish a certification, signed by both surveyor and Contractor, to Inspector.
- B. Related Sections:
 - 1. Section 01 11 00: Summary.
 - 2. Section 01 31 00: Coordination and Project Meetings.
 - 3. Section 01 33 00: Submittals.

1.3 SURVEY CONTROLS

- A. Vertical control shall use same benchmark used in the preparation of topographic survey. When Work consists of both onsite and off-site, and benchmarks differ, an equation shall be indicated on Drawings.
- B. Horizontal control for existing structures shall be the property line.

1.4 LAYOUT OF WORK

- A. All work related to staking shall be by a land surveyor, or Civil Engineer, registered with the State of California to perform land surveying and employed by Contractor.
- B. Before commencement of Work, surveyor shall locate all reference points and benchmarks to be used for vertical and horizontal control.
- C. Surveyor shall lay out entire Work, set grades, lines, levels, control points, elevations, grids and positions.

1.5 RECORD DOCUMENTS

- A. Maintain complete and accurate log of all control and survey documentation as work progresses.
- B. Record, by coordinates, all utilities onsite with top of pipe elevations, at major grade and alignment changes, rim, grate, or top of curb and flow line elevations of all drainage structures and sewer manholes.
- C. Indicate reference and control points on record drawings. The basis of elevation shall be

one of the established benchmarks.

- D. Upon Beneficial Occupancy, obtain and pay for reproducible Plans. Deliver Plans to District representative. Clearly indicate all differences between original drawings and completed Work within specified tolerances.

1.6 SUBMITTALS

- A. Surveyor: Submit name, address, and license number to Owner, including any changes as they occur.
- B. Field Notes: Upon request by District representative, submit copies of cut sheets, coordinate plots, data collector printouts, marked-up construction staking plans, and other documentation as available to verify accuracy of field engineering work during and at completion of Project. Submittals to Owner must be signed and sealed by surveyor and counter-signed by Contractor
- C. Statement of Compliance: Contractor shall submit a statement of certification signed and sealed by surveyor, counter-signed by Contractor, indicating compliance with grades and alignment of construction Plans at rough grade, fine grade, and top of rock stages. Inspector shall approve survey submittals for each stage of construction prior to proceeding with work.
- D. Upon Beneficial Occupancy: Contractor shall obtain and pay for reproducible survey drawings (or "As Built").
- E. Completed record drawings shall be signed and certified as correct and within specified tolerances by licensed surveyor. Originals and two (2) sets of blueprints shall be submitted to Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 PREPARATION

- A. Pre-mark areas of excavation in accordance with the requirements of "Dig-Alert." Request locators two (2) days before commencing excavation.
- B. Before commencing Work, establish all horizontal and vertical reference points used in Contract Documents according to existing field conditions.
- C. Preserve established reference lines and benchmarks.
- D. Differentiate school and city datum as applicable.
- E. Relocate benchmarks that may interfere with Work.
- F. Reset and re-establish reference marks damaged or lost during construction.

3.2 SURVEY REQUIREMENTS GENERAL

- A. Establish a minimum of two (2) permanent horizontal and vertical control points on Project site, remote from construction area, referenced to data established by control points.

- B. Indicate reference points, relative to benchmark elevation, on record drawings.
- C. Provide grade stakes and elevations to construct over excavation and re-compaction, rough and final grades, paved areas, curbs, gutters, sidewalks, building pads, landscaped areas, and other areas as required.
- D. Calculate and layout proposed finished elevations and intermediate controls, as required, to provide smooth transitions between spot elevations indicated on Drawings.
- E. Provide stakes and elevations for grading, fill, and topsoil placement.
- F. Provide adequate horizontal and vertical control to locate utility lines, including but not limited to, storm, sewers, water mains, gas and electric, and signal and provide vertical control in proportion to the slope of the line as required for accurate construction. Dry utilities will be based upon adequate horizontal and vertical control layout. Prior to trench closure, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished concrete or asphaltic concrete (AC), and surfaces at key locations such as beginning-of-curve (BC), end-of-curve (EC), grade breaks, corners, or angle points in sufficient number to demonstrate the Work complies with the intent of the Contract Documents.
- G. Provide horizontal and vertical control for batter boards for drainage, utility, and other onsite structures as required.
- H. Furnish building corner offsets as required to adequately locate building pads. Provide cut and fill stakes within the building pad perimeter adequate to control both over excavation and re-compaction and the final sub-grade elevation of the building pad.
- I. Submit a certification signed by the surveyor confirming the elevations and locations of improvements are in conformance with the Contract Documents. The statement shall include survey notes for the finish floor and building pad, showing the actual measured elevations on the completed sub-grade, recorded to the nearest 0.01 of a foot. Building pad tolerance will be plus or minus 0.1 of a foot.
- J. Establish a minimum of two (2) permanent horizontal and vertical control points on Project site, remote from building area, referenced to data established by survey control points.
- K. Mark boundaries for rights-of-way dedications and easements for utilities prior to marking location of buildings and utilities.
- L. Layout all lines, elevations, and measurements needed for construction or installation of buildings, grading, paving, and utilities according to the following:
 - 1. Identify site boundary and property lines.
 - 2. Provide working benchmarks.
 - 3. Set stakes for Bottom of Excavated Plane (BEP).
 - 4. Set gridlines, radii, working points, etc. for foundation.
 - 5. Set and verify building pad elevations.
 - 6. Set finish floor elevations.
 - 7. Stake location and elevations for exterior ramps and stairs.
 - 8. Set gridlines, radii, working points, etc., for all floors of multi-story buildings.
 - 9. Set storm drain, sanitary sewer inverts, and other utilities as needed at five-foot (5') offset from building lines.
 - 10. For new facilities, establish permanent onsite benchmark with two-inch (2") diameter brass disk. Location of benchmark to be determined by Owner.

3.3 SURVEY REQUIREMENTS FOR GRADING

- A. Provide grade stakes and elevations as follows:
 - 1. Removal limits (cut lines).
 - 2. Rough grade staking: 60-foot maximum grid plus additional stakes at grade changes and pertinent locations. Flag all grade changes including ridges, flow lines, and grade breaks.
 - 3. Fine grade for top of dirt: 30-foot maximum grid plus additional stakes at grade changes and pertinent locations. Flag all grade changes including ridges, flow lines, and grade breaks.
 - 4. Verify fine grade for top of rock: 30-foot maximum grid plus additional stakes at grade changes and pertinent locations. Flag all grade changes including ridges, flow lines, and grade breaks.
 - 5. Finish grade marks on all buildings, structures, and at pertinent locations.
 - 6. Finish grades and offsets for all concrete work, utilities, landscape areas, and structures.
 - 7. Provide controls and baselines for playground striping.
 - 8. Off-site improvements: Set grades and provide grade sheets as required by local authorities.
- B. Provide a minimum of two (2) permanent horizontal and vertical control points onsite, remote from building area, referenced to data established by survey control points.

3.4 SURVEY REQUIREMENTS FOR UTILITIES

- A. Locate “wet” utility lines and provide vertical control proportionate to slope of line as required for accurate construction. “Dry” utilities shall have adequate horizontal and vertical control layout supplied by others.
- B. Prior to back-filling trench, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished surfaces at key locations (such as back of curbs, grade breaks, corners, or angle points) in sufficient number to demonstrate Work complies with intent of Contract Documents.
- C. Provide horizontal and vertical control for batter boards for drainage, utility, and other onsite structures as required:
 - 1. Set grades for vaults one inch (1”) higher than adjacent surrounding design grades, unless noted otherwise.
- D. Leave all trenches open until required inspection is completed.

3.5 SURVEY REQUIREMENTS FOR STRUCTURES

- A. Furnish building corner offsets as required to adequately locate building pads. Provide cut and fill stakes within building pad perimeter adequate to control both over excavation and re-compaction and final sub-grade elevation of building pad.
- B. Submit a certification signed by surveyor confirming elevations and locations of improvements are in conformance with Contract Documents. Statement shall include survey notes for finish floor and building pad, showing actual measured elevations on completed sub-grade, recorded to nearest 0.01 of a foot. Building pad tolerance will be plus or minus 0.1 of a foot.

END OF SECTION 01 71 23

DOCUMENT 01 73 00

EXECUTION

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. 01 31 00 Coordination and Project Meetings;
- 1.1.5. 01 33 00 Submittals;
- 1.1.6. 01 60 00 Materials and Equipment;
- 1.1.7. 01 73 10 Cutting and Patching;
- 1.1.8. 01 77 00 Contract Closeout and Final Cleaning; and
- 1.1.9. 01 91 00 Commissioning.

1.2. SUMMARY

- 1.2.1. This Document includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1.2.1.1. Construction layout;
 - 1.2.1.2. Field engineering and surveying;
 - 1.2.1.3. General installation of products;
 - 1.2.1.4. Owner furnished, Contractor installed items;
 - 1.2.1.5. Coordination of District-installed products;
 - 1.2.1.6. Progress cleaning;
 - 1.2.1.7. Starting and adjusting;
 - 1.2.1.8. Protection of installed construction; and
 - 1.2.1.9. Correction of the Work.

1.3. SUBMITTALS

- 1.3.1. Qualification Data: For land surveyor or professional engineer.
- 1.3.2. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.
- 1.3.3. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept the materials as classified, for hazardous waste disposal.
- 1.3.4. Certified Surveys: Submit electronic files and three (3) paper copies signed by land surveyor or professional engineer.
- 1.3.5. Final Property Survey: Submit electronic files and three (3) paper copies showing the Work performed and record survey data.

2. EXECUTION

2.1. EXAMINATION

- 2.1.1. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning Site Work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 2.1.1.1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2.1.1.2. Furnish location data for Work related to Project that must be performed by public utilities serving the Project Site.

2.2. PREPARATION

- 2.2.1. Existing Utility Information: Furnish information to local utility 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.
- 2.2.2. 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.
- 2.2.3. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- 2.2.4. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to District per requirements of Document "01 26 10 Requests for Information." Include a

detailed description of problem encountered, together with recommendations for any necessary changes to the Contract Documents.

2.3. CONSTRUCTION LAYOUT

- 2.3.1. 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 District and its consultant promptly.
- 2.3.2. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.
 - 2.3.2.1. 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.
 - 2.3.2.2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 2.3.2.3. Inform installers of lines and levels to which they must comply.
 - 2.3.2.4. Check the location, level and plumb, of every major element as the Work progresses.
 - 2.3.2.5. Notify District and its consultant when deviations from required lines and levels exceed allowable tolerances.
 - 2.3.2.6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- 2.3.3. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- 2.3.4. 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.
- 2.3.5. 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 District and its consultant.

2.4. FIELD ENGINEERING

- 2.4.1. 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.
 - 2.4.1.1. Do not change or relocate existing benchmarks or control points without prior written approval of District and its consultant. Report lost or destroyed permanent benchmarks or control points promptly. Report

the need to relocate permanent benchmarks or control points to District and its consultant before proceeding.

- 2.4.1.2. Require surveyor to replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- 2.4.1.3. Provide adequate horizontal and vertical control to locate utility lines, including but not limited to, storm, sewers, water mains, gas, electric and signal and provide vertical control in proportion to the slope of the line as required for accurate construction. Dry utilities will be based upon adequate horizontal and vertical control layout. Prior to trench closure, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished concrete or asphaltic concrete (AC) surfaces at key locations such as beginning-of-curve (BC), end-of-curve (EC), grade breaks, corners or angle points in sufficient number to demonstrate the Work complies with the intent of the Contract Documents.
- 2.4.2. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project Site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 2.4.2.1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2.4.2.2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 2.4.2.3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- 2.4.3. Records: Contractor shall maintain a complete, accurate log of all control and survey Work as it progresses. On request of District or Architect, Contractor shall submit documentation to verify accuracy of field engineering Work at no additional cost to the District.
- 2.4.4. Certified Survey: On completion of foundation walls, major site improvements, and other Work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- 2.4.5. Final Property Survey: Prepare and submit a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey and are in conformance with Contract Documents.
 - 2.4.5.1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a Site corner to a legal point.

- 2.4.6. Compliance with Laws: Contractor is responsible for meeting all applicable codes, OSHA, safety, and shoring requirements.
- 2.4.7. Nonconforming Work: Contractor is responsible for any re-surveying required by correction of nonconforming Work.

2.5. INSTALLATION

- 2.5.1. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 2.5.1.1. Make vertical Work plumb and make horizontal Work level.
 - 2.5.1.2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 2.5.1.3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 2.5.1.4. Maintain minimum headroom clearance of 7 feet in spaces without a suspended ceiling.
- 2.5.2. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- 2.5.3. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Completion.
- 2.5.4. 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.
- 2.5.5. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels where possible.
- 2.5.6. 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.
- 2.5.7. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 2.5.7.1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by District.
 - 2.5.7.2. Allow for building movement, including thermal expansion and contraction.
 - 2.5.7.3. 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.

- 2.5.8. 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.
- 2.5.9. Hazardous Materials: Use products, cleaners, and installation materials that are not classed as hazardous per the MSDS sheets for the products where possible. If hazardous materials are necessary, inform District where and when they will be used no less than 48 hours before use. Take all recommended precautions of the materials' manufacturers to ensure safe use and clean-up.

2.6. OWNER FURNISHED, CONTRACTOR INSTALLED

- 2.6.1. Certain materials identified in the Contract Documents as Owner Furnished Contractor Installed (OFCI) will be delivered to the Project site by the Owner. Contractor shall unload, store, uncrate, assemble, install, and connect Owner supplied materials.
- 2.6.2. One-hundred and twenty (120) days before the date the Contractor needs to have the OFCI materials on site, Contractor shall notify Owner of the scheduled date for needed OFCI materials. Upon delivery to Project site, Contractor shall store OFCI materials inside rooms and or protected spaces and will be responsible for security of OFCI materials until occupancy. District will sign receipt or bill of lading, as applicable.
- 2.6.3. Contractor shall, within five (5) calendar days after delivery, uncrate and/or unpack OFCI materials in presence of District Representative who shall inspect delivered items. District Representative shall prepare an inspection report listing damaged or missing parts and accessories. District shall transmit copy of the report to Contractor. District will procure and/or replace missing and/or damaged OFCI materials, as indicated in inspection report.
- 2.6.4. Contractor shall install OFCI materials in the locations and orientation as indicated in the Contract Documents. Contractor shall verify exact locations with District Representative before final installation of OFCI materials.
- 2.6.5. If required, District Representative will furnish setting and/or placement drawings for OFCI materials.
- 2.6.6. Contractor shall install OFCI materials by proper means and methods to ensure an installation as recommended by the manufacturer. Contractor shall furnish and install all necessary fasteners and required blocking to properly install OFCI materials.
- 2.6.7. Contractor shall install OFCI materials with manufacturer recommended fasteners for the type of construction to which the OFCI materials are being fastened and/or anchored.

- 2.6.8. Contractor shall provide final connections of any electrical, signal, gas, water, waste, venting and/or similar items to OFCI materials. Contractor shall, prior to final connection, verify the operating characteristics of OFCI materials are consistent with the designated supply.

2.7. DISTRICT-INSTALLED PRODUCTS

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

2.8. PROGRESS CLEANING

- 2.8.1. General: Clean Project Site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 2.8.1.1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2.8.1.2. Do not hold materials more than seven (7) calendar days during normal weather or three (3) calendar days if the temperature is expected to rise above 80 degrees F.
 - 2.8.1.3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations. Remove hazardous and unsanitary waste materials daily.
- 2.8.2. Site: Maintain Project Site free of waste materials and debris.
- 2.8.3. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 2.8.3.1. Remove liquid spills promptly.
 - 2.8.3.2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

- 2.8.4. 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.
- 2.8.5. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- 2.8.6. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Completion.
- 2.8.7. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- 2.8.8. 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 Completion.
- 2.8.9. 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.
- 2.8.10. 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.

2.9. STARTING AND ADJUSTING

- 2.9.1. Start equipment and operating components to confirm proper operation. Replace or repair malfunctioning units and retest.
- 2.9.2. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- 2.9.3. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- 2.9.4. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Document "01 40 00 Quality Requirements."

2.10. PROTECTION OF INSTALLED CONSTRUCTION

- 2.10.1. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Completion.
- 2.10.2. Comply with manufacturer's written instruction for temperature and relative humidity unless otherwise addressed in the construction planning, sequences, and instructions.

2.11. CORRECTION OF THE WORK

2.11.1. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Document "01 73 10 Cutting and Patching."

2.11.1.1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

2.11.2. Restore permanent facilities used during construction to their specified condition.

2.11.3. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

2.11.4. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

2.11.5. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF DOCUMENT

DOCUMENT 01 73 10

CUTTING AND PATCHING

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions, including, without limitation, Inspector, Inspections, and Tests, Integration of Work, Nonconforming Work, and Correction of Work, and Uncovering Work;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. Hazardous Materials Procedures and Requirements;
- 1.1.5. Hazardous Materials Certification;
- 1.1.6. Lead-Based Materials Certification; and
- 1.1.7. Imported Materials Certification.
- 1.1.8. 01 78 36 Warranties

1.2. CUTTING AND PATCHING

- 1.2.1. The word “cutting” as used in the Contract Documents includes, but is not limited to, cutting, drilling, chopping, and other similar operations and the word “patching” includes, but is not limited to, patching, rebuilding, reinforcing, repairing, refurbishing, restoring, replacing, or other similar operations. Contractor shall be responsible for all cutting, fitting, and patching, including associated excavation and backfill, required to complete the Work or to:
 - 1.2.1.1. Make several parts fit together properly.
 - 1.2.1.2. Uncover portions of Work to provide for installation of ill-timed Work.
 - 1.2.1.3. Remove and replace defective Work.
 - 1.2.1.4. Remove and replace Work not conforming to requirements of Contract Documents.
 - 1.2.1.5. Remove Samples of installed Work as specified for testing.
 - 1.2.1.6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

- 1.2.1.7. Attaching new materials to existing remodeling areas – including painting (or other finishes) to match existing conditions.
- 1.2.2. In addition to Contract requirements, upon written instructions from District, Contractor shall uncover Work to provide for observations of covered Work in accordance with the Contract Documents, remove samples of installed materials for testing as directed by District, and remove Work to provide for alteration of existing Work.
- 1.2.3. Contractor shall not cut or alter Work, or any part of it, in such a way that endangers or compromises the integrity of the Work, the Project, or Work of others.
- 1.2.4. Contractor shall not cut and patch operating elements or safety related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
 - 1.2.4.1. Primary operational systems and equipment.
 - 1.2.4.2. Air, fire, moisture, or smoke barriers.
 - 1.2.4.3. Fire-suppression systems.
 - 1.2.4.4. Mechanical systems piping and ducts.
 - 1.2.4.5. Control systems.
 - 1.2.4.6. Communication systems.
 - 1.2.4.7. Conveying systems.
 - 1.2.4.8. Electrical wiring systems.
- 1.2.5. Contractor shall not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing capacity to perform as intended, or that results in increased maintenance or decreased operational life of safety. Miscellaneous elements include the following:
 - 1.2.5.1. Water, moisture, smoke, or vapor barriers.
 - 1.2.5.2. Membranes and flashings.
 - 1.2.5.3. Exterior curtain-wall construction.
 - 1.2.5.4. Equipment supports.
 - 1.2.5.5. Piping, ductwork, vessels and equipment.
 - 1.2.5.6. Noise and vibration control elements and systems.
 - 1.2.5.7. Shoring, bracing and sheeting.

1.3. REQUEST TO CUT, ALTER, PATCH OR EXCAVATE

- 1.3.1. Contractor shall submit written notice to District pursuant to the applicable notice provisions of the Contract Documents, requesting consent to proceed with the cutting or alteration ("Request") at least ten (10) calendar days prior to any cutting or alterations that may affect the structural safety of the Project, or Work of others, including the following:
 - 1.3.1.1. The Work of the District or other trades.
 - 1.3.1.2. Structural value or integrity of any element of the Project.
 - 1.3.1.3. Integrity or effectiveness of weather-exposed or weather-resistant elements or systems.
 - 1.3.1.4. Efficiency, operational life, maintenance or safety of operational elements.
 - 1.3.1.5. Visual qualities of sight-exposed elements.
- 1.3.2. Contractor's Request shall also include:
 - 1.3.2.1. Identification of the Project.
 - 1.3.2.2. Description of affected Work.
 - 1.3.2.3. Necessity for cutting, alterations, or excavations and indicate why it cannot be avoided.
 - 1.3.2.4. Impacts of that Work on the District, other trades, or structural or weatherproof integrity of the Project.
 - 1.3.2.5. Description of proposed Work:
 - 1.3.2.5.1. Scope of cutting, patching, alterations, or excavations.
 - 1.3.2.5.2. Trades that will execute Work.
 - 1.3.2.5.3. Products proposed to be used.
 - 1.3.2.5.4. Extent of refinishing to be done.
 - 1.3.2.5.5. Utilities that will be disturbed or affected. List utilities to be relocated and any that will be out of service. Include length of time services will be disrupted.
 - 1.3.2.6. Alternates to cutting and patching.
 - 1.3.2.7. Cost proposal, when applicable.
 - 1.3.2.8. The scheduled date the Work is to be performed and the duration of time to complete the Work.
 - 1.3.2.9. Written permission of other trades whose Work will be affected.

1.3.2.10. Impacts to any warranties of existing work, shall require verification of original installer and any warranty requirements. Contractor must replace, patch, and repair items cut or damaged by methods and with materials in such a manner as not to void or diminish any warranties required or existing.

1.4. QUALITY ASSURANCE

- 1.4.1. Contractor shall ensure that cutting, fitting, and patching shall achieve security, strength, weather protection, appearance for aesthetic match, efficiency, operational life, maintenance, safety of operational elements, and the continuity of existing fire ratings.
- 1.4.2. Contractor shall ensure that cutting, fitting, and patching shall successfully duplicate undisturbed adjacent profiles, materials, textures, finishes, and colors, and that materials shall match existing construction. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the District's decision shall be final.
- 1.4.3. Obtain approval from Architect and DSA of the cutting and patching request before cutting and patching structural elements.

1.5. PAYMENT FOR COSTS

- 1.5.1. Costs caused by ill-timed or defective Work or Work not conforming to Contract Documents, including costs for additional services of the District or its consultants including but not limited to the Architect, inspector(s), engineers, and agents, will be paid by Contractor and/or deducted from the Contract Price by the District.
- 1.5.2. Contractor shall provide written cost proposals prior to proceeding with cutting and patching. District shall only pay for cost of Work if it is part of the Contract Price or if a change has been made to the Contract in compliance with the provisions of the General Conditions. Cost of Work performed upon instructions from the District, other than defective or nonconforming Work, will be paid by District on approval of written Change Order in accordance with the Contract Documents.

2. PRODUCTS

2.1. MATERIALS

- 2.1.1. Contractor shall provide for replacement and restoration of Work removed. Contractor shall comply with the Contract Documents and with the industry standard(s), for the type of Work, and the Specification requirements for each specific product involved. If not specified, Contractor shall recommend a product of a manufacturer or appropriate trade association for approval by the District.
- 2.1.2. Materials to be cut and patched include those damaged by the performance of the Work.

3. EXECUTION

3.1. INSPECTION

- 3.1.1. Contractor shall inspect existing conditions of the Site and the Work, including elements subject to movement or damage during cutting and patching, excavating and backfilling. After uncovering Work, Contractor shall inspect conditions affecting installation of new products.
- 3.1.2. Contractor shall report unsatisfactory or questionable conditions in writing to District as indicated in the General Conditions and shall proceed with Work as indicated in the General Conditions by District.

3.2. PREPARATION

- 3.2.1. Contractor shall provide shoring, bracing and supports as required to maintain structural integrity for all portions of the Project, including all requirements of the Project.
- 3.2.2. Contractor shall provide devices and methods to protect other portions of Project from damage.
- 3.2.3. Contractor shall, provide all necessary protection from weather and extremes of temperature and humidity for the Project, including without limitation any work that may be exposed by cutting and patching Work. Contractor shall keep excavations free from water.

3.3. ERECTION, INSTALLATION AND APPLICATION

- 3.3.1. With respect to performance, Contractor shall ensure its Subcontractors:
 - 3.3.1.1. Execute fitting and adjustment of products to provide finished installation to comply with and match specified tolerances and finishes.
 - 3.3.1.2. Execute cutting and demolition by methods that will prevent damage to other Work, and provide proper surfaces to receive installation of repairs and new Work.
 - 3.3.1.3. Execute cutting, demolition excavating, and backfilling by methods that will prevent damage to other Work and damage from settlement.
 - 3.3.1.4. Contractor shall use District approved installer or fabricator to perform cutting and patching for:
 - 3.3.1.5. Weather-exposed surfaces and moisture-resistant elements such as roofing, sheet metal, sealants, waterproofing, and other trades.
 - 3.3.1.6. Sight-exposed finished surfaces.
- 3.3.2. Contractor shall ensure its Subcontractors execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes as shown or specified in the Contract Documents including, without limitation, the Drawings and Specifications.
- 3.3.3. Subcontractors shall fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Contractor shall conform to all Code requirements for

penetrations or the Drawings and Specifications, whichever calls for a higher quality or more thorough requirement. Contractor shall maintain integrity of both rated and non-rated fire walls, ceilings, floors, etc.

- 3.3.4. Contractor's Subcontractors shall restore Work which has been cut or removed and install new products to provide completed Work in accordance with requirements of the Contract Documents and as required to match surrounding areas and surfaces.
- 3.3.5. Contractor's Subcontractors shall refinish all continuous surfaces to nearest intersection as necessary to match the existing finish to any new finish.

END OF DOCUMENT

SECTION 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Waste Management Plan: Submit plan within ten (10) days of date established for commencement of the Work.
- B. Waste Reduction Progress Reports:
 - 1. Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:
 - a. Material category.
 - b. Generation point of waste.
 - c. Total quantity of waste in tons (tonnes).
 - d. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
 - e. Quantity of waste recycled, both estimated and actual in tons (tonnes).

- f. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
 - g. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- C. 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.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Firm having minimum ten (10) years of documented experience in specializing in waste management coordination.
- B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Waste Management Conference:
 - 1. Conduct conference at site. Review methods and procedures related to waste management including, but not limited to, the following:
 - a. Review and discuss waste management plan including responsibilities of waste management coordinator.
 - b. Review requirements for documenting quantities of each type of waste and its disposition.
 - c. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - d. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - e. Review waste management requirements for each trade.

1.6 PERFORMANCE REQUIREMENTS

- A. Conform to County regulations regarding Solid Waste Control.
- B. Achieve end of Project rates for salvage/recycling of 50 percent by weight of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials:
 - 1. Demolition waste:
 - a. Asphalt paving.
 - b. Concrete.
 - c. Concrete reinforcing steel.
 - d. Brick.
 - e. Concrete masonry units.
 - f. Wood studs.
 - g. Wood joists.
 - h. Plywood and oriented strand board.
 - i. Wood paneling.
 - j. Wood trim.
 - k. Structural and miscellaneous steel.
 - l. Rough hardware.
 - m. Roofing.
 - n. Insulation.
 - o. Doors and frames.
 - p. Door hardware.
 - q. Windows.
 - r. Glazing.
 - s. Metal studs.
 - t. Gypsum board.
 - u. Acoustical tile and panels.
 - v. Carpet.
 - w. Carpet pad.
 - x. Demountable partitions.
 - y. Equipment.
 - z. Cabinets.
 - aa. Plumbing fixtures.
 - bb. Piping.
 - cc. Supports and hangers.
 - dd. Valves.
 - ee. Sprinklers.
 - ff. Mechanical equipment.
 - gg. Refrigerants.
 - hh. Electrical conduit.
 - ii. Copper wiring.
 - jj. Lighting fixtures.
 - kk. Lamps.
 - ll. Ballasts.
 - mm. Electrical devices.
 - nn. Switchgear and panelboards.
 - oo. Transformers.
 - 2. Construction waste:
 - a. Masonry and CMU.
 - b. Lumber.
 - c. Wood sheet materials.
 - d. Wood trim.

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

1.7 WASTE MANAGEMENT PLAN

- A. Develop a waste management plan and requirements. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition site clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan:
 - 1. List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures:
 - a. Salvaged materials for reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - b. Salvaged materials for sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - c. Salvaged materials for donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - d. Recycled materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - e. Disposed materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - f. Handling and transportation procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- D. Cost/Revenue Analysis:
 - 1. Indicate total cost of waste disposal as if there was no waste management plan and

net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:

- a. Total quantity of waste.
- b. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
- c. Total cost of disposal (with no waste management).
- d. Revenue from salvaged materials.
- e. Revenue from recycled materials.
- f. Savings in hauling and tipping fees by donating materials.
- g. Savings in hauling and tipping fees that are avoided.
- h. Handling and transportation costs. Include cost of collection containers for each type of waste.
- i. Net additional cost or net savings from waste management plan.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 PLAN IMPLEMENTATION

- A. Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract:
 1. Comply with operation, termination, and removal requirements in Section 01 50 00: Temporary Facilities and Controls.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training:
 1. Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work:
 - a. Distribute waste management plan to everyone concerned within three (3) days of submittal return.
 - b. Distribute waste management plan to entities when they first begin work onsite. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls:
 1. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities:
 - a. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - b. Comply with Section 01 50 00: Temporary Facilities and Controls for the control of dust and dirt, environmental protection, and noise control.
- E. Waste Management in Historic Zones or Areas: Hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, by 12 inches (300 mm) or more.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work:
 - 1. Salvage items for reuse and handle:
 - a. Clean salvaged items.
 - b. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - c. Store items in a secure area until installation.
 - d. Protect items from damage during transport and storage.
 - e. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use:
 - 1. Salvage items for Owner's use and handle as follows:
 - a. Clean salvaged items.
 - b. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - c. Store items in a secure area until delivery to Owner.
 - d. Transport items to Owner's storage area designated by Owner.
 - e. Protect items from damage during transport and storage.
- D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors, unless otherwise designated by Owner.
- E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- F. Plumbing Fixtures: Separate by type and size.
- G. Lighting Fixtures: Separate lamps by type and protect from breakage.
- H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING WASTE

- A. Recycle paper and beverage containers used by onsite workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.
- 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:
 - 1. 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:
 - a. 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:

- 1) Inspect containers and bins for contamination and remove contaminated materials if found.
- b. Stockpile processed materials onsite without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
- c. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
- d. Store components off the ground and protect from the weather.
- e. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 DISPOSAL OF WASTE

- A. 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 to accumulate onsite.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning:
 1. Do not burn waste materials:
 - a. Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.
- C. Disposal: Remove waste materials and dispose of at designated spoil areas on Owner's property.

3.5 ATTACHMENTS

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

CWM FORMS ON FOLLOWING PAGES

FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION							
MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED* (A)	EST. WASTE - % (B)	TOTAL EST. QUANTITY OF WASTE* (C = A x B)	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							

Electrical Conduit							
Other:							

FORM CWM-2: DEMOLITION WASTE IDENTIFICATION				
MATERIAL DESCRIPTION	EST. QUANTITY	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Asphaltic Concrete Paving				
Concrete				
Brick				
CMU				
Lumber				
Plywood and OSB				
Wood Paneling				
Wood Trim				
Miscellaneous Metals				
Structural Steel				
Rough Hardware				
Insulation				
Roofing				
Doors and Frames				
Door Hardware				
Windows				
Glazing				
Acoustical Tile				
Carpet				
Carpet Pad				
Demountable Partitions				
Equipment				
Cabinets				
Plumbing Fixtures				
Piping				
Piping Supports and Hangers				
Valves				
Sprinklers				
Mechanical Equipment				
Electrical Conduit				
Copper Wiring				
Light Fixtures				
Lamps				
Lighting Ballasts				
Electrical Devices				
Switchgear and Panelboards				
Transformers				
Other:				

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

FORM CWM-4: DEMOLITION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Asphaltic Concrete Paving						
Concrete						
Brick						
CMU						
Lumber						
Plywood and OSB						
Wood Paneling						
Wood Trim						
Miscellaneous Metals						
Structural Steel						
Rough Hardware						
Insulation						
Roofing						
Doors and Frames						
Door Hardware						
Windows						
Glazing						
Acoustical Tile						
Carpet						
Carpet Pad						
Demountable Partitions						
Equipment						
Cabinets						
Plumbing Fixtures						
Piping						
Supports and Hangers						
Valves						
Sprinklers						
Mechanical Equipment						
Electrical Conduit						
Copper Wiring						
Light Fixtures						
Lamps						
Lighting Ballasts						
Electrical Devices						
Switchgear and Panelboards						
Transformers						
Other:						

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

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

FORM CWM-6: COST/REVENUE ANALYSIS OF DEMOLITION WASTE REDUCTION WORK PLAN								
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mech. Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								
Other:								

FORM CWM-7: CONSTRUCTION WASTE REDUCTION PROGRESS REPORT								
MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-8: DEMOLITION WASTE REDUCTION PROGRESS REPORT								
MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATE D TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATE D TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mechanical Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								
Other:								

END OF SECTION 01 74 19

DOCUMENT 01 77 00

CONTRACT CLOSEOUT AND FINAL CLEANING

1. GENERAL

1.1. RELATED DOCUMENTS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions including, without limitation, Documents on Work and Completion of Work;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. 01 33 00 Submittals;
- 1.1.5. 01 78 36 Operation and Maintenance Data;
- 1.1.6. 01 78 36 Warranties;
- 1.1.7. 01 78 39 Record Documents;
- 1.1.8. Demonstration and Training; and
- 1.1.9. 01 91 00 I Commissioning.

1.2. PRELIMINARY PROCEDURES

- 1.2.1. Before requesting inspection for determining date of Completion, complete the following. List items below that are incomplete in request.
 - 1.2.1.1. Prepare a list of items to be completed and corrected ("Punch List"), the value of items on the list, and reasons why the Work is not complete.
 - 1.2.1.2. Advise District of pending insurance changeover requirements.
 - 1.2.1.3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 1.2.1.4. Obtain and submit releases permitting District unrestricted use of the Work and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases, if required.
 - 1.2.1.5. Prepare and submit Project Record Documents, operation and maintenance manuals, Completion construction photograph prints and electronic files, damage or settlement surveys, property surveys, and similar final record information.

- 1.2.1.6. Deliver tools, spare parts, extra materials, and similar items to location designated by District. Label with manufacturer's name and model number where applicable.
- 1.2.1.7. Make final changeover of permanent locks and deliver keys to District. Advise District's personnel of changeover in security provisions.
- 1.2.1.8. Complete startup testing of systems.
- 1.2.1.9. Submit test/adjust/balance records.
- 1.2.1.10. Terminate and remove temporary facilities from Project Site, along with mockups, construction tools, and similar elements.
- 1.2.1.11. Advise District of changeover in heat and other utilities.
- 1.2.1.12. Submit changeover information related to District's occupancy, use, operation, and maintenance.
- 1.2.1.13. Complete final cleaning requirements, including touch-up painting.
- 1.2.1.14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

1.3. RECORD DOCUMENTS AND SHOP DRAWINGS

- 1.3.1. Contractor shall legibly mark each item to record actual construction, including:
 - 1.3.1.1. Measured depths of foundation in relation to finish floor datum.
 - 1.3.1.2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permit surface improvements.
 - 1.3.1.3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 1.3.1.4. Field changes of dimension and detail.
 - 1.3.1.5. Details not on original Contract Drawings
 - 1.3.1.6. Changes made by modification(s).
 - 1.3.1.7. References to related Shop Drawings and modifications.
 - 1.3.1.8. Contractor will provide one set of Record Drawings to District.
 - 1.3.1.9. Contractor shall submit all required documents to District and/or Architect prior to or with its final Application for Payment.

1.4. COMPLETION

- 1.4.1. Preliminary Procedures: Before requesting inspection for determining date of Completion, complete the following:
 - 1.4.1.1. Submit a final Application for Payment according to the Contract Documents.
 - 1.4.1.2. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 1.4.1.3. Submit pest-control final inspection report and warranty.
 - 1.4.1.4. Instruction of District Personnel:
 - 1.4.1.4.1. Before final inspection, at agreed upon times, Contractor shall instruct District's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 - 1.4.1.4.2. For equipment requiring seasonal operation, Contractor shall perform instructions for other seasons within six (6) months.
 - 1.4.1.4.3. Contractor shall use operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
 - 1.4.1.4.4. Contractor shall prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction. Provide additional data to the District within three (3) business days of instruction and/or training.
- 1.4.2. Inspection: Submit a written request for inspection.
- 1.4.3. **LIST OF INCOMPLETE ITEMS (PUNCH LIST)** Contractor shall notify District and Architect when Contractor considers the Work complete. Upon notification, District and Architect will prepare a list of minor items to be completed or corrected ("Punch List").
- 1.4.4. Contractor and/or its Subcontractors shall proceed promptly to complete and correct items on the Punch List. Failure to include an item on Punch List does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.
- 1.4.5. Contractor shall comply with Punch List procedures as provided herein and in the Contract Documents, and maintain the presence of a Project Superintendent and Project Manager until the Punch List is complete to ensure proper and timely completion of the Punch List. Under no circumstances shall Contractor demobilize its forces prior to completion of the Punch List. Upon receipt of Contractor's written notice that all of the Punch List items have been fully completed and the Work is ready for final inspection and acceptance, District and Architect will inspect the Work and shall submit to Contractor a final inspection report noting the Work, if any, required in order to reach Completion in accordance with the Contract Documents. Absent unusual

circumstances, this report shall consist of the Punch List items not yet satisfactorily completed and any additional Punch List items not originally included.

- 1.4.6. Upon Contractor's completion of all items on the Punch List and any other uncompleted portions of the Work, the Contractor shall notify the District and Architect, who shall again inspect such Work. If the District and Architect find the Work complete and acceptable under the Contract Documents, the District will notify Contractor, who shall then jointly submit to the Architect and District its final Application for Payment.
- 1.4.7. **Costs of Multiple Inspections.** More than two (2) requests of District to make a final inspection shall be considered an additional service of District, the Architect and/or the Inspector, and all subsequent costs will be invoiced to Contractor and withheld from remaining payments, if funds are available.
- 1.4.8. Punch List shall be deemed complete only upon the District's determination that all items on the Punch List, and all updates to the Punch List, are complete.

1.5. WARRANTIES

- 1.5.1. Submittal Time: Submit written warranties on request of District for designated portions of the Work where commencement of warranties other than date of Completion is indicated.
- 1.5.2. Organize warranty documents into an orderly sequence as required by the Division 01 Document "01 78 36 Warranties."

2. PRODUCTS

2.1. MATERIALS

- 2.1.1. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

3. EXECUTION

3.1. FINAL CLEANING

- 3.1.1. Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations. Contractor shall use cleaning methods and procedures that reduce the overall impact on human health and the natural environment by reducing the amount of disposed waste, pollution and environmental degradation.
- 3.1.2. Contractor shall employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program.
 - 3.1.2.1. Complete the following cleaning operations before requesting final inspection:

- 3.1.2.1.1. Clean Project Site, yard, and grounds, in areas disturbed by construction activities, including landscape development

- areas, of rubbish, waste material, litter, and other foreign substances.
- 3.1.2.1.2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - 3.1.2.1.3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - 3.1.2.1.4. Remove tools, construction equipment, machinery, and surplus material from Project Site.
 - 3.1.2.1.5. Remove snow and ice to provide safe access to building.
 - 3.1.2.1.6. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - 3.1.2.1.7. Clean all surfaces and other work in accordance with recommendations of the manufacturer.
 - 3.1.2.1.8. Remove spots, mortar, plaster, soil, and paint from ceramic tile, stone, and other finish materials.
 - 3.1.2.1.9. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - 3.1.2.1.10. Sweep concrete floors broom clean in unoccupied spaces.
 - 3.1.2.1.11. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - 3.1.2.1.12. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - 3.1.2.1.13. Remove labels that are not permanent.
 - 3.1.2.1.14. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 3.1.2.1.14.1. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

- 3.1.2.1.15. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - 3.1.2.1.16. Replace parts subject to unusual operating conditions.
 - 3.1.2.1.17. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - 3.1.2.1.18. Replace disposable air filters and clean permanent air filters on all HVAC equipment provided, portable or permanent. Clean exposed surfaces of diffusers, registers, and grills.
 - 3.1.2.1.19. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - 3.1.2.1.20. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - 3.1.2.1.21. Leave Project Site clean and ready for occupancy.
- 3.1.3. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Submit pest control plan and proposed exterminator to District for approval prior to implementation of any extermination.
 - 3.1.4. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on District's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project Site and dispose of lawfully.

END OF DOCUMENT

DOCUMENT 01 78 23

OPERATION AND MAINTENANCE DATA

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions, including, without limitation, Completion of the Work;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. 01 33 00 Submittals;
- 1.1.5. 01 77 00 Contract Closeout and Final Cleaning;
- 1.1.6. 01 78 36 Warranties;
- 1.1.7. 01 78 39 Record Documents;
- 1.1.8. 01 91 00 Commissioning.

1.2. QUALITY ASSURANCE

- 1.2.1. Contractor shall prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.3. FORMAT

- 1.3.1. Contractor shall prepare data in the form of an instructional manual entitled "OPERATIONS AND MAINTENANCE MANUAL & INSTRUCTIONS" ("Manual"). Manual to be submitted electronically through District approved software for approval by District prior to submission of any printed materials. Final submission of Manual to be one (1) printed set of documents as well as the complete electronic set, see format below.
- 1.3.2. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size. When multiple binders are used, Contractor shall correlate data into related consistent groupings.
- 1.3.3. Cover: Contractor shall identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL & INSTRUCTIONS"; and shall list title of Project and identify subject matter of contents.
- 1.3.4. Contractor shall arrange content by systems process flow under section numbers and sequence of the Table of Contents of the Contract Documents.

- 1.3.5. Contractor shall provide tabbed fly leaf for each separate Product and system, with typed description of Product and major component parts of equipment.
- 1.3.6. Text: The content shall include Manufacturer's printed data, or typewritten data on 24 pound paper.
- 1.3.7. Drawings: Contractor shall provide with reinforced punched binder tab and shall bind in with text; folding larger drawings to size of text pages.

1.4. CONTENTS, EACH VOLUME

- 1.4.1. Table of Contents: Contractor shall provide title of Project; names, addresses, and telephone numbers of the Architect, any engineers, subconsultants, Subcontractor(s), and Contractor with name of responsible parties; and schedule of Products and systems, indexed to content of the volume.
- 1.4.2. For Each Product or System: Contractor shall list names, addresses, and telephone numbers of Subcontractor(s) and suppliers, including local source of supplies and replacement parts.
- 1.4.3. Product Data: Contractor shall mark each sheet to clearly identify specific Products and component parts, and data applicable to installation. Delete inapplicable information.
- 1.4.4. Drawings: Contractor shall supplement Product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Contractor shall not use Project Record Documents as maintenance drawings.
- 1.4.5. Text: The Contractor shall include any and all information as required to supplement Product data. Contractor shall provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

1.5. MANUAL FOR MATERIALS AND FINISHES

- 1.5.1. Building Products, Applied Materials, and Finishes: Contractor shall include Product data, with catalog number, size, composition, and color and texture designations. Contractor shall provide information for re-ordering custom manufactured Products.
- 1.5.2. Instructions for Care and Maintenance: Contractor shall include Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- 1.5.3. Moisture Protection and Weather Exposed Products: Contractor shall include Product data listing applicable reference standards, chemical composition, and details of installation. Contractor shall provide recommendations for inspections, maintenance, and repair.
- 1.5.4. Additional Requirements: Contractor shall include all additional requirements as specified in the Specifications.
- 1.5.5. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.6. MANUAL FOR EQUIPMENT AND SYSTEMS

- 1.6.1. Each Item of Equipment and Each System: Contractor shall include description of unit or system, and component parts and identify function, normal operating characteristics, and limiting conditions. Contractor shall include performance curves, with engineering data and tests, and complete nomenclature, and commercial number of replaceable parts.
- 1.6.2. Panelboard Circuit Directories: Contractor shall provide electrical service characteristics, controls, and communications.
- 1.6.3. Contractor shall include color coded wiring diagrams as installed.
- 1.6.4. Operating Procedures: Contractor shall include start-up, break-in, and routine normal operating instructions and sequences. Contractor shall include regulation, control, stopping, shut-down, and emergency instructions. Contractor shall include summer, winter, and any special operating instructions.
- 1.6.5. Maintenance Requirements: Contractor shall include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- 1.6.6. Contractor shall provide servicing and lubrication schedule, and list of lubricants required.
- 1.6.7. Contractor shall include manufacturer's printed operation and maintenance instructions.
- 1.6.8. Contractor shall include sequence of operation by controls manufacturer.
- 1.6.9. Contractor shall provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- 1.6.10. Contractor shall provide control diagrams by controls manufacturer as installed.
- 1.6.11. Contractor shall provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- 1.6.12. Contractor shall provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- 1.6.13. Contractor shall provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- 1.6.14. Additional Requirements: Contractor shall include all additional requirements as specified in Specification(s).
- 1.6.15. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.7. SUBMITTAL

- 1.7.1. Concurrent with the Schedule of Submittals as indicated in the General Conditions, Contractor shall submit to the District for review two (2) copies of a preliminary draft of proposed formats and outlines of the contents of the Manual.
- 1.7.2. For equipment, or component parts of equipment put into service during construction and to be operated by District, Contractor shall submit draft content for that portion of the Manual within ten (10) calendar days after acceptance of that equipment or component.
- 1.7.3. On or before the Contractor submits its final application for payment, Contractor shall submit electronically a complete Manual in final form. The District will provide comments to Contractor and Contractor must revise the content of the Manual as required by District prior to District's approval of Contractor's final Application for Payment.
- 1.7.4. Contractor must submit electronically as well as one (1) printed copy of revised Manual in final form within ten (10) business days after receiving District's comments. Failure to do so will be a basis for the District withholding funds sufficient to protect itself for Contractor's failure to provide a final Manual to the District.

END OF DOCUMENT

DOCUMENT 01 78 36

WARRANTIES

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions, including, without limitation, Warranty/Guarantee/Indemnity;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. 01 33 00 Submittals;
- 1.1.5. 01 77 00 Contract Closeout and Final Cleaning;
- 1.1.6. 01 78 23 Operation and Maintenance Data;
- 1.1.7. 01 78 39 Record Documents;
- 1.1.8. 01 91 00 Commissioning.

1.2. FORMAT

- 1.2.1. Contractor to provide all warranties using the District's Warranty Form and Warranty Contact Log Form. . Final Warranties must be submitted electronically through District approved software in addition to the one (1) printed set of final documents.
- 1.2.2. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size.
- 1.2.3. Cover: Contractor shall identify each binder with typed or printed title "WARRANTIES" and shall list the title of Project. Warranties shall be provided in a separate binder and not combined with Operation and Maintenance Data Binder.
- 1.2.4. Table of Contents: Contractor shall provide the 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. Contractor shall utilize District Warranty Contact Log Form.
- 1.2.5. 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).

- 1.2.6. In addition to all Warranty documentation and information required herein, Contractor shall provide its Guarantee as required by the Contract Documents

1.3. PREPARATION

- 1.3.1. Contractor shall obtain Warranties, executed in duplicate by each applicable and/or responsible Subcontractor(s), supplier(s), and manufacturer(s), within ten (10) calendar days after completion of the applicable item or Work. Except for items put into use with District's permission, Contractor shall leave date of beginning of time of Warranty until the date of Completion is determined.
- 1.3.2. Contractor shall verify that Warranties are in proper form, contain full information, and are notarized, when required.
- 1.3.3. Contractor shall co-execute submittals when required.
- 1.3.4. Contractor shall retain warranties until time specified for submittal.

1.4. TIME OF SUBMITTALS

- 1.4.1. Schedule of Warranties. Contractor shall provide District with a Schedule of Warranties at least fourteen (14) calendar days prior to submitting its other required submittals indicated herein. This will provide District the opportunity to review the anticipated Warranties and make any comments, suggestions or revisions the District may require.
- 1.4.2. 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) calendar days after acceptance of that equipment or component.
- 1.4.3. On or before the Contractor submits its final application for payment, Contractor shall submit all Warranties and related documents in final form. The District shall indicate any Warranty-related Work that is being performed and incomplete at the time Contractor submits its final application for payment. District will provide comments to Contractor and Contractor must revise the content of the Warranties as required by District prior to District's approval of Contractor's final Application for Payment.
- 1.4.4. For items of Work that are not completed until after the date of Completion, Contractor shall provide an updated Warranty for those item(s) of Work within ten (10) calendar days after acceptance, listing the date of acceptance as start of the Warranty period.

END OF DOCUMENT

DOCUMENT 01 78 39

RECORD DOCUMENTS

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions, including, without limitation, Documents on Work and Completion of Work;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. 01 33 00 Submittals;
- 1.1.5. 01 77 00 Contract Closeout and Final Cleaning;
- 1.1.6. 01 78 23 Operation and Maintenance Data;
- 1.1.7. 01 78 36 Warranties;
- 1.1.8. 01 91 00 Commissioning.

2. RECORD DOCUMENTS OR DRAWINGS

2.1. GENERAL

- 2.1.1. "Record Documents" and "Record Drawings" may also be referred to in the Contract Documents as "As-Built Drawings."
- 2.1.2. As indicated in the Contract Documents, District will provide Contractor with one set of reproducible plans of the original Drawings.
- 2.1.3. Contractor shall maintain at each Project Site one (1) set of marked-up Drawings and shall transfer all changes and information to those marked-up Drawings, as often as required in the Contract Documents, but in no case less than once each month. Contractor shall submit to the Project Inspector one set of reproducible vellums of the Project Record Documents ("As-Built") showing all changes incorporated into the Work since the preceding monthly submittal. The As-Built shall be available at the Project Site. The Contractor shall submit reproducible vellums at the conclusion of the Project following review of the blue line prints.
- 2.1.4. Label and date each Record Document "RECORD DOCUMENT" in legibly printed letters.
- 2.1.5. All deviations in construction, including but not limited to pipe and conduit locations and deviations caused, without limitation, by Change Orders, Construction Directives, RFIs, and Addenda shall be accurately and legibly recorded by Contractor.

- 2.1.6. Locations and changes shall be done by Contractor in a neat and legible manner and, where applicable, indicated by drawing a "cloud" around the changed or additional information.

2.2. RECORD DOCUMENT INFORMATION

- 2.2.1. Contractor shall record the following information:
 - 2.2.1.1. Locations of Work buried under or outside each building, including, without limitation, all utilities, plumbing and electrical lines, and conduits.
 - 2.2.1.2. Actual numbering of each electrical circuit.
 - 2.2.1.3. Locations of significant Work concealed inside each building whose general locations are changed from those shown on the Drawings.
 - 2.2.1.4. Locations of all items, not necessarily concealed, which vary from the Contract Documents.
 - 2.2.1.5. Installed location of all cathodic protection anodes.
 - 2.2.1.6. Deviations from the sizes, locations, and other features of installations shown in the Contract Documents.
 - 2.2.1.7. Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stubouts, invert elevations, etc.
 - 2.2.1.8. Sufficient information to locate Work concealed in each building with reasonable ease and accuracy.
- 2.2.2. In some instances, this information may be recorded by dimension. In other instances, it may be recorded in relation to the spaces in the building near which it was installed.
- 2.2.3. Contractor shall provide additional Drawings as necessary for clarification.
- 2.2.4. Contractor shall provide in an electronic format as indicated in the Contract Documents, a copy of the Drawings, made from final Shop Drawings marked "No Exceptions Taken" or "Approved as Noted."
 - 2.2.4.1. With the District's prior approval, Contractor may provide these reproducible Drawings in hard copy.

3. RECORD MATERIALS LOG

- 3.1.1. Materials Log shall be submitted prior to Completion.
- 3.1.2. Preparation: Mark Material Log to indicate the actual product installation where installation varies from that indicated in original Material Log.
- 3.1.3. Give particular attention to information on concealed materials and installations that

cannot be readily identified and recorded later.

- 3.1.4. Mark copy with the proprietary name and characteristics of products, materials, and equipment furnished, including substitutions and product options selected.
- 3.1.5. Record the name of the manufacturer, supplier, installer, and other information necessary to provide a record of selections made.
- 3.1.6. The working copy of Materials Log shall be consistently maintained throughout construction, and shall be accessible at Project Site.

4. MAINTENANCE OF RECORD DOCUMENTS

- 4.1. Contractor shall store Record Documents apart from documents used for construction as follows:
 - 4.1.1. Provide files and racks for storage of Record Documents.
 - 4.1.2. Maintain Record Documents in a clean, dry, legible condition and in good order.
- 4.2. Contractor shall not use Record Documents for construction purposes.

END OF DOCUMENT

DOCUMENT 01 91 00

COMMISSIONING

1. GENERAL

1.1. RELATED DOCUMENTS AND PROVISIONS

Contractor shall review all Contract Documents for applicable provisions related to the provisions in this document, including without limitation:

- 1.1.1. General Conditions, including, without limitation, Documents on Work and Completion of Work;
- 1.1.2. Special Conditions (if any);
- 1.1.3. Supplemental Conditions (if any);
- 1.1.4. 01 33 00 Submittals;
- 1.1.5. 01 77 00 Contract Closeout and Final Cleaning;
- 1.1.6. 01 78 23 Operation and Maintenance Data;
- 1.1.7. 01 78 36 Warranties;
- 1.1.8. 01 78 39 Record Documents

1.2. SUMMARY

- 1.2.1. Commissioning is a process for validating and documenting that the facility and its systems are constructed and perform in conformity with the Contract Documents.
- 1.2.2. The objective of the commissioning process is to verify that the performance of the facility and its systems meet or exceed the design intent.
- 1.2.3. Commissioning includes special facility start-up processes used to bring the facility to a fully operational state, free of deficiencies in an efficient and timely manner.
- 1.2.4. Training on related systems and equipment operation and maintenance shall be scheduled to commence only after start-up is complete and systems are verified to be 100% complete and functional.
- 1.2.5. Complete: 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 a manner to ensure well-balanced performance, in accordance with manufacturer's recommendations and in accordance with Contract Documents.

1.3. DESCRIPTION

The following applies to all Contract Documents:

- 1.3.1. **Contractor Startup:** Sub-phase of Contractor's work ending with Acceptance of Work, during which Contractor performs a pre-planned program of activities including starting, testing, inspecting, adjusting balancing, correcting deficiencies and other similar activities.
 - 1.3.1.1. The District, Construction Manager and Architect and the Inspector shall be present to observe, inspect and identify deficiencies in building systems operations.
- 1.3.2. The completion of startup means the entire Construction Project including startup and fine tuning has been performed to the requirements of the Contract Documents and is verified in writing by the District, Construction Manager and Architect.
- 1.3.3. **Fine Tuning:** Fine tuning is the responsibility of Contractors after District occupancy and ending one (1) year after District occupancy. During this time the Contractor is responsible for optimizing systems and correcting deficiencies arising under normal operating conditions.
 - 1.3.3.1. Includes a period after occupancy where systems are optimized under "live" operating conditions and any outstanding construction deficiencies are corrected.
 - 1.3.3.2. Fine Tuning shall extend from date of District occupancy to one year after occupancy.

1.4. DEFINITION OF TERMS

- 1.4.1. **Contractor's Pre-Commissioning Checklists:** Includes installation and start-up items as specified to be completed by the appropriate contractors prior to operational verification through the functional testing process.
- 1.4.2. **Installation Verification Process:** Includes the on-site inspection and review of related system components for conformance to Contract Documents. The Contractor shall verify systems readiness for functional testing procedures prior to the start of functional testing. Deficiencies will be documented by the Inspector for future resolution.
- 1.4.3. **Functional Performance Testing Process:** Includes the documented testing of system parameters, under actual or simulated operating conditions. Final performance commissioning of systems will begin only after the appropriate Contractor certifies that systems are 100% complete and ready for functional testing. The Contractor will be required to schedule, coordinate and perform device tests, calibration and functional performance test procedures.
- 1.4.4. **Deficiencies and Resolutions List:** Includes a list of noted deficiencies discovered as a result of the commissioning process. This list also includes the current disposition of issues, and the date of final resolution as confirmed by the Construction Manager and

Inspector. Deficiencies are defined as those issues where products execution or performance does not satisfy the Project Contract Documents and/or the design intent.

1.5. COMMISSIONING SCHEDULE

- 1.5.1. Provide schedules for Contractor Start-Up work.
- 1.5.2. Incorporate in overall construction schedule.
- 1.5.3. Contractor's activities, which will be performed as specified under Fine Tuning, shall be completed within one (1) year from date of occupancy by the District.

1.6. CONTRACTOR RESPONSIBILITIES

- 1.6.1. Provide utility services required for the commissioning process.
- 1.6.2. Contractor is responsible for construction means, methods, job safety, and/or management function related to commissioning on the Project Site.
- 1.6.3. Contractor shall assign representatives with expertise and authority to act on behalf of Contractor and schedule the representatives to participate in and perform commissioning team activities including, but not limited to, the following:
 - 1.6.3.1. Participate in design and construction-phase coordination meetings.
 - 1.6.3.2. Participate in maintenance orientation and inspection.
 - 1.6.3.3. Participate in operation and maintenance training sessions.
 - 1.6.3.4. Participate in final review.
 - 1.6.3.5. Certify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
 - 1.6.3.6. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 - 1.6.3.7. Review and comment on final commissioning documentation.
- 1.6.4. Contractor shall integrate all commissioning activities into Contractor's Construction Schedule.
- 1.6.5. Contractor's Subcontractors shall assign representatives with expertise and authority to act on behalf of subcontractors and schedule the representatives to participate in and perform commissioning team activities including, but not limited to, the following:
 - 1.6.5.1. Participate in design and construction-phase coordination meetings.
 - 1.6.5.2. Participate in maintenance orientation and inspection.

- 1.6.5.3. Participate in procedures meeting for testing.
- 1.6.5.4. Participate in final review.
- 1.6.5.5. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to Commissioning Authority for incorporation into the commissioning plan. Update schedule on a weekly basis throughout the construction period.
- 1.6.5.6. Provide information to the Commissioning Authority for developing construction phase commissioning plan.
- 1.6.5.7. Participate in training sessions for District's operation and maintenance personnel. Arrange for training with the District a minimum of fourteen (14) calendar days in advance. Provide agenda in advance of training sessions. Record attendance and video record trainings. Copy of sign-in sheet, agenda and video recording to be turned over to District within three (3) business days of each training.
- 1.6.5.8. Provide updated Project Record Documents to Commissioning Authority on a daily basis.
- 1.6.5.9. Gather and submit operation and maintenance data for systems, subsystems, and equipment to the Commissioning Authority, as specified in Division 01 Document "01 78 23 Operation and Maintenance Data."
- 1.6.5.10. Provide technicians who are familiar with the construction and operation of installed systems, who shall execute the test procedures developed by the Commissioning Authority, and who shall participate in testing of installed systems, subsystems, and equipment.

1.7. SUBMITTALS

- 1.7.1. Submit Draft and Final Contractor Start-up Forms as described in this Document. Submit Draft Report for Construction Manager and Architect's review and comment prior to Final Submission. Submit Final Report not later than twenty weeks before scheduled date of Acceptance of Work.
- 1.7.2. Prepare and submit one copy of report form to be used in preparation of system reports for:
 - 1.7.2.1. Food Service Equipment.
 - 1.7.2.2. Scoreboard
 - 1.7.2.3. Each mechanical system specified in Division 23.
 - 1.7.2.4. Each Electrical system specified in Division 26.
- 1.7.3. Each System Report shall be submitted including the following:

- 1.7.3.1. Project Name
- 1.7.3.2. Name of System
- 1.7.3.3. Index of report's content
- 1.7.3.4. Adjacent to list of equipment, columns to indicate status of equipment operation, to date and to sign off equipment start-up.
- 1.7.3.5. Space to record equipment and operational problems which cannot be corrected with scheduled Contractor Start-Up program and which may delay Acceptance of Work.
- 1.7.3.6. Manufacturer's equipment start-up reports.
- 1.7.3.7. Systems' testing, balancing, and adjusting reports.
- 1.7.3.8. Equipment Report Forms shall include the following: Project name, name of equipment, starting and testing procedures to be performed and observations and test results to be recorded.

1.8. QUALITY ASSURANCE

- 1.8.1. Training Instructor Qualifications: Contractor shall provide factory-authorized service representatives, experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.
- 1.8.2. Test Equipment Calibration: Comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments (per NIST requirements if applicable) immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

1.9. EQUIPMENT & SYSTEM SCHEDULE

- 1.9.1. The following equipment shall be commissioned in this Project:

System	Equipment	Note
HVAC System	Packaged AC units	
	Exhaust fans	
	Supply fans	
	Return fans	
Building Management System	Sequences of Operation, Monitored Points, and Alarms	
	Metering/Monitoring Devices and Equipment	
	Software Commissioning, GUI presentation commissioning, system access performance criteria, software tools/source code commissioning, instrument data sheets,	

	middleware commissioning, Internet Protocol commissioning	
Electrical System	Sweep or scheduled lighting controls	
	Daylight dimming controls	
	Lighting occupancy sensors	
	Electrical grounding	
Plumbing System	Domestic water heaters	
Security Alarm Systems	Security cameras and monitoring system personal duress alarm system; Intercom system; Paging System.	
Security Electronics	Door Controls.	
	Fire alarm system.	
	Access control system.	
Fire/Life Safety Systems	All devices	
	Alarm drivers	
	HVAC/Fire System Integration	
	Event Notifying and Reporting Systems	
Communication System	District Technology Information & Systems Branch (TISB)	

1.10. SYSTEM FAILURES

After a second failure of a system to successfully meet the criteria as set for in the functional performance testing process, the Contractor shall reimburse the District for cost associated with any additional retesting required due to uncorrected deficiencies. Costs shall include salary, benefits, overhead, travel costs and per diem lodging costs if applicable.

END OF DOCUMENT

SECTION 02 41 16 STRUCTURE DEMOLITION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of existing buildings including existing site features or elements associated as indicated on Drawings.
 - 2. Removing below-grade under existing buildings all electrical, plumbing, and landscape irrigation elements outwards to a minimum of five feet (5') in any direction.
 - 3. Disconnect, cap or seal, and abandoning in-place all site utilities to an area designated on Drawings.
 - 4. Remove all utilities, power, and water and provide new utilities to new location.
 - 5. Salvaging items for reuse by Owner.
- B. Related Sections:
 - 1. Section 01 73 10: Cutting and Patching.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse or store. Include fasteners or brackets needed for reattachment elsewhere.

1.4 SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures:
 - 1. Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers:
 - a. Adjacent buildings: Detail special measures proposed to protect adjacent buildings to remain including means of egress from those buildings.
- C. Schedule of Building Demolition Activities:
 - 1. Indicate the following:
 - a. Detailed sequence of demolition work, with starting and ending dates for each activity.
 - b. Temporary interruption of utility services.
 - c. Shutoff and capping or re-routing of utility services.
- D. Pre-Demolition Photographs or Video: Show existing conditions of adjoining construction

and site improvements, including finish surfaces, which might be misconstrued as damage caused by demolition operations. Submit before the Work begins.

- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- F. Inventory: Submit a list of items that have been removed and salvaged.

1.5 PERFORMANCE REQUIREMENTS

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

1.6 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Pre-demolition conference to be conducted at Project site:
 - 1. Inspect and discuss condition of construction to be demolished.
 - 2. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review and finalize protection requirements.
 - 4. Review procedures for noise control and dust control.
 - 5. Review procedures for protection of adjacent buildings.
 - 6. Review items to be salvaged and returned to Owner.
- C. Arrange demolition schedule so as not to interfere with Owner's onsite operations or operations of adjacent occupied buildings.
- D. Arrange demolition schedule so as not to interfere with work performed by other contractors onsite. Coordinate work for equipment used to not deter or stop work by others.

1.7 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Division 31.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted:
 - 1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings:
 - a. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings:
 - 1) Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical:
 - 1. Before building demolition, Owner will remove the following items:
 - a. Refer to demolition drawings for items to be removed by Owner.
- D. Hazardous Materials:
 - 1. It is not expected that hazardous materials will be encountered in the Work:
 - a. Hazardous materials will be removed by Owner before start of the Work.
 - b. If elements suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

3.2 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project record documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project record documents.
- C. Engage a professional Engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.
- D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- E. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.3 PREPARATION

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

3.4 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Utilities to be Disconnected:
 - 1. Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished:
 - a. Owner will arrange to shut off utilities when requested by Contractor.
 - b. Arrange to shut off utilities with utility companies.
 - c. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
 - d. Cut off pipe or conduit a minimum of 24 inches (610 mm) below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
 - e. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.5 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Temporary Shoring:
 - 1. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished:
 - a. Strengthen or add new supports when required during progress of demolition.
- C. Existing Utilities to Remain:
 - 1. Maintain utility services to remain and protect from damage during demolition operations:
 - a. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
 - b. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction:
 - 1) Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.
- D. Temporary Protection:
 - 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 01 50 00: Temporary Facilities and Controls:
 - a. Protect adjacent buildings and facilities from damage due to demolition activities.
 - b. Protect existing site improvements, appurtenances, and landscaping to remain.

- c. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - d. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - e. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 - f. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
 - g. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.6 DEMOLITION, GENERAL

- A. Demolish indicated buildings and site elements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 - 2. Maintain fire watch during and for at least two (2) hours after flame-cutting operations.
 - 3. Maintain adequate ventilation when using cutting torches.
 - 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls:
 - 1. Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities:
 - a. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 - b. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.7 DEMOLITION BY EXPLOSIVES

- A. **No explosives** are to be used on this Project.

3.8 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above floor or tier before disturbing supporting members on the next lower level.
- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent:
 - 1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

- C. Salvage:
 - 1. Items to be removed and salvaged are indicated below:
 - a. Doors and door hardware.
 - b. Windows.
 - c. Cabinets.
 - d. Mirrors.
 - e. Chalkboards.
 - f. Tackboards.
 - g. Marker boards.
 - h. Plumbing fixtures.
- D. Below-Grade Construction: Abandon foundation walls and other below-grade construction. Cut below-grade construction flush with grade.
- E. Existing Utilities:
 - 1. Demolish existing utilities and below-grade utility structures that are within five feet (5') outside footprint indicated for new construction. Abandon utilities outside this area.
 - a. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements in Division 31.
- F. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.
- G. Hydraulic Elevator Systems: No system on Project.

3.9 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.10 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.
- B. Promptly repair damaged sidewalks, roadways, fencing, or retaining walls to nearest expansion joint. Replace in-kind or as designated by Architect.

3.11 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction and recycle or dispose of them.
 - 1. Do not allow demolished materials to accumulate onsite.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

3.12 CLEANING

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

END OF SECTION 02 41 16

SECTION 03 02 00 CONCRETE RESURFACING, REPAIR, AND MOISTURE VAPOR MITIGATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes preparation of existing interior concrete slabs, including shot blasting, surface defect repair, application of moisture vapor control system, and moisture vapor and pH testing, where indicated on Drawings, for underlayment and finish flooring specified in other Sections.
- B. Reference Standards (Use Current Versions):
 - 1. ASTM F3010 Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Covering.
 - 2. ASTM C1583 Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method).
 - 3. ASTM D7234 Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
 - 4. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 - 5. ICRI Guide 310.2R Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.
 - 6. RFCI Recommended Work Practices for the Removal of Resilient Floor Coverings, Resilient Floor Covering Institute.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Submit manufacturer's data sheets and supporting information for each product and process specified including:
 - a. Product specifications.
 - b. Installation instructions.
 - c. Manufacturer's certification that moisture vapor control products meet requirements of current version of ASTM F3010.
 - d. Independent test reports supporting product manufacturer's certificate of conformance to ASTM F3010.
 - e. Completed manufacturer's pre-installation checklist.
 - f. Warranty Information.
- B. Moisture Tests: Submit concrete floor moisture test results required by floor covering manufacturer. Perform moisture testing as described in ASTM F710. Testing shall be performed according to the floor covering manufacturer's specified ASTM Standard Test Method by an independent testing agency. Testing shall be performed by ICRI Tier 2 Certified Moisture Testing Technician. Provide moisture test results to Architect, Owner, General Contractor, and moisture vapor control system manufacturer's representative.

1.4 QUALITY ASSURANCE

- A. Qualifications of Applicator:
 - 1. Employ an applicator trained and currently approved by the moisture vapor control system manufacturer, experienced in surface preparation and application of the products of this Section, and subject to observation by the manufacturer.
 - 2. Submit list of at least three (3) similar projects performed by the applicator within the previous five (5) years that used the same products and similar moisture vapor control system design.
- B. Manufacturer's Qualifications:
 - 1. Manufacturer shall have not less than ten (10) years' experience in manufacturing moisture vapor control systems. The moisture vapor control system must be specifically formulated and marketed for concrete floor slab moisture vapor control and pH control.
- C. Provide manufacturer's standard 15 year warranty at no additional cost. Applicator of moisture vapor control system shall provide standard installation warranty for workmanship.
- D. Mockup: Install the moisture control system in a minimum 100-square-foot mockup area, using the same methods and equipment that will be used for the entire installation. Test tensile bond strength of the moisture mitigation system to the concrete substrate following ASTM D7234. The results must be equal to or greater than 200 psi with failure in the concrete before proceeding with installation of the moisture control system.
- E. Scheduling: The independent testing agency will coordinate scheduling with Owner for moisture testing to permit sufficient time to test, submit and evaluate test results, and install the moisture vapor control system before installation of floor coverings.
- F. VOC Limits:
 - 1. VOC's for all concrete primers and concrete sealers shall be limited to 100 grams per liter or less.
 - 2. VOC's for all sealants and all adhesives shall be limited as follows:
 - a. Low-solid adhesives and sealants: VOC's shall be limited to 70 grams per liter of material, or less.
 - b. Non-low-solid adhesives and sealants: VOC's shall be limited to 70 grams per liter of adhesive or sealant less water and less exempted compounds as specified by South Coast Air Quality Management District (SCAQMD) Rule 1168, or less.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the jobsite in original unopened containers, clearly labeled with the manufacturer's name and brand designation. Each container shall be marked with batch or lot code traceable to manufacturing information.
- B. Store products in an approved ventilated dry area; protect from dampness, freezing, and direct sunlight. Product shall not be stored in areas with temperatures in excess of 90 degrees F or below 50 degrees F unless permitted by manufacturer's instructions.
- C. Handle products using methods that prevent breakage or damage of containers and prevent contamination of products.
- D. Project/Site Conditions:
 - 1. Environmental Conditions:
 - a. Do not apply moisture vapor control system to surfaces that may be exposed to uncontrolled weather conditions such as precipitation, wind, direct sunlight, etc. Do

- not apply when moisture is accumulated on the surface of the concrete or if precipitation is anticipated before the moisture control coating has cured.
- b. Do not apply moisture vapor control system when temperature is lower than 50 degrees F or higher than 90 degrees F or expected to fall outside this temperature range within 24 hours after application. Do not apply moisture vapor control coating when temperature is above 80 degrees F and rising or expected to rise during curing period of the moisture control coating.
- E. Protection: Protect moisture vapor control system after installation to prevent damage from topical moisture, direct sunlight, and construction traffic for a minimum period of 24 hours after application.
- F. The moisture vapor control system manufacturer's instructions must allow installation as early as seven (7) days after concrete placement.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: **KOSTER VAP I® 2000 System**, as manufactured by KOSTER American Corporation, 2585 Aviator Drive, Virginia Beach, VA 23453; (757) 425-1206; www.kosterusa.com
- B. Moisture vapor control system shall be the product of a single manufacturer. Equivalent products of other manufacturers may be submitted for review and approval as substitutions in accordance with Section 01 25 13: Product Substitution Procedures.

2.2 MATERIALS

- A. General: Use materials of one manufacturer throughout the Project as hereinafter specified.
- B. Moisture Vapor Control Coating:
 - 1. Select from among the following products (if fast setting time is not essential, use the first option below):
 - a. KOSTER VAP I® 2000 ZERO VOC; 12-hour setting time, Zero VOC, 2-part epoxy resin coating.
 - b. KOSTER VAP I® 2000 FS; 4 to 5-hour setting time, Zero VOC. 2-part epoxy resin coating.
 - c. KOSTER VAP I® 2000 UFS; 3 to 4-hour setting time, low VOC, 2-part epoxy resin coating.
- C. Primer for Underlayment:
 - 1. KOSTER VAP I® 06 Primer – non-porous substrate primer for use on VAP I® 2000 resin coating.
- D. Self-Leveling Underlayment:
 - 1. Select from among the following products:
 - a. KOSTER SL Premium.
 - b. KOSTER SC.
- E. Primer for porous concrete containing excessive near-surface voids or high concrete

surface profile:

1. KOSTER KB-Pox IN, low viscosity, high modulus, 2-part epoxy resin.
- F. Repair resin for non-movement joints and cracks:
1. KOSTER KB-Pox IN low-viscosity, high modulus 2-part epoxy gravity-feed, crack injection resin.
- G. Thickening agent for repairing spalls and excessively rough concrete:
1. KOSTER TA Fiber thickening agent, non-silica.
- H. Movement Joint Sealant:
1. KOSTER FS-H polysulfide resin joint sealant.
 2. Backer rod and accessory materials.

PART 3 EXECUTION

3.1 EXAMINATION OF SUBSTRATE BEFORE INSTALLATION

- A. Provide information required in moisture control system manufacturer's pre-job checklist. Submit completed checklist to moisture control system manufacturer for review before installation of the moisture control system.
- B. Concrete floor slab moisture testing is not required prior to application of moisture control system:
1. If moisture testing is performed, moisture testing shall be conducted according to the latest version of ASTM F2170 using relative humidity probes that have been allowed to equilibrate at each test location for at least two (2) hours. Provide report in accordance with ASTM F2170 and floor plan showing moisture test results.
- C. Testing and evaluation for deleterious materials and contaminants that inhibit moisture control coating adhesion:
1. It is the responsibility of Owner to provide a concrete floor slab free of contaminants and deleterious materials that can inhibit bond to the moisture control coating or develop deleterious reactions after the concrete floor slab is sealed.
 2. Concrete substrates must be structurally sound, solid, and meet industry standards as defined in ACI Committee 201 Report "Guide to Durable Concrete." Surfaces must be free of moisture-sensitive patching and leveling materials, adhesives, coatings, curing compounds, concrete sealers, efflorescence, dust, grease, oils, and any other materials or contaminants that can act as bond breakers.
 3. The floor slab surface must be capable of withstanding steel shot blast preparation to ICRI CSP3. Excessively weak, soft, dusty, cracked, or uneven surfaces may not be suitable substrates, and may require additional concrete surface removal or patching before application of the moisture control coating. Such compounds must be long term resistant to high moisture and high pH.
 4. Contaminated concrete may not be suitable to receive a moisture control coating. Testing and evaluation for contaminants and concrete condition is not required but is strongly recommended. Testing and evaluation of the floor slab can include:
 - a. Solvent extraction and analysis for organic compounds such as oil, grease, plasticizers, silicones, solvents, and other chemical compounds that can inhibit bond to the epoxy moisture control coating.
 - b. Microscopical (petrographic) examination according to ASTM C856 to evaluate the concrete condition.
 5. Do not install moisture control system if substrate testing reveals unacceptable

conditions.

3.2 PREPARATION

- A. Remove existing floor finishes including floor coverings, coatings, paint, and adhesives. Follow RFCI Recommended Work Practices for the Removal of Resilient Floor Coverings.
- B. Abrasive Surface Preparation:
 - 1. Grind perimeter of rooms and areas inaccessible to shotblasting using dry diamond media with vacuum dust extraction. Grind to ICRI CSP2. Do not smooth polish these areas. Grinding is allowed only in areas not accessible to shot blasting
 - 2. Shot blast floors to ICRI CSP3. Shot blast as close as possible to walls, doorways, casework, and other permanently installed objects. Remove residual steel shot.
 - 3. Acid etching is not permitted.
- C. Remove residual dust and debris by vacuum and dry sweeping. Do not use sweeping compound. Remove all foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, shot blast beads, etc.
- D. Test concrete surface tensile strength after abrasive preparation in accordance with requirements of ASTM F3010 following Test Method C1583. If test results are less than 200 psi, repair concrete or repeat surface preparation to achieve required concrete surface tensile strength.
- E. Repair non-movement cracks, control joints, and large surface defects such as spalls, holes, and voids in accordance with manufacturer's recommendations. Use low-viscosity, gravity-fed crack mending resin for non-movement cracks and joints. Crack repair compound can be mixed with not more than three-part clean, washed, dry silica sand for saw cut control joints and wide cracks. Brush interior walls of crack or joint with neat crack repair epoxy resin before applying sand-resin mixture. After curing, grind surface flush with surrounding concrete.
- F. Repair spalls or excessively rough concrete surface using manufacturer's fiber thickening agent mixed 1:1 by volume with moisture control resin. Mix thickening agent and resin thoroughly to a uniform creamy consistency and apply by trowel, working material tightly against clean, roughened concrete surface.
- G. Do not fill designed movement joints with moisture control epoxy resin. Fill movement joints with manufacturer's recommended flexible joint filling compound or mechanical movement joint cover.
- H. Reinforcing fibers that become visible after shot blasting must be removed and vacuumed leaving no fibers exposed above the concrete surfaces. Provide an uncontaminated, clean, sound surface.

3.3 MIXING

- A. Mix two-part moisture control resin and hardener thoroughly for three (3) minutes in manufacturer supplied containers following manufacturer's requirements to obtain a homogeneous mixture. Use a low speed motor less than 400 rpm and a two-bladed Jiffy-type mixing blade only. Do not aerate.

- B. If smaller quantities are required, maintain manufacturer's specified mix ratios by volume.
- C. Do not dilute with solvent.

3.4 APPLICATION

- A. After mixing, immediately pour material on the substrate in a ribbon. Empty can completely. Do not invert can to drain on concrete.
- B. Spread moisture control coating using manufacturer's recommended notched squeegee and back-roll with a 3/8-inch nap epoxy-rated, lint-free roller. Completely cover the entire concrete surface with a uniform application of the moisture control coating as quickly as possible and allow the coating to self-level. Work into a wet edge and assure continuity of the coating across the entire area.
- C. Spread coating on ICRI CSP3 shot blasted concrete surface at 100 to 150 square-feet-per-gallon. Concrete prepared to CSP3 coated at 100 to 150 square-feet-per-gallon will yield average cured coating thickness 11 to 16 mils (0.011 to 0.016 inch). A rougher surface profile or a porous or absorptive concrete will require the use of more material to achieve sufficient coating thickness. KOSTER VAP I® 2000 moisture control coatings must be installed at a minimum layer thickness of at least 11 mils (0.011 inch). Less layer thickness results in a higher permeance of the cured coating that will not meet performance requirements of ASTM F3010.
- D. Allow coating to cure the minimum length of time specified for the product.

3.5 INSPECTION

- A. Inspect cured moisture control coating for complete, uniform coverage. Repair or install additional coats as necessary to produce a uniform, flat, and smooth coating surface that meets manufacturer's minimum thickness requirements in all areas.
- B. Test adhesion of the moisture control coating to the concrete substrate as required in ASTM F3010 following Test Method D7234. Tensile bond strength of the coating must be at least 200 psi with failure in the concrete. Repair or replace areas that do not meet this requirement.

3.6 CEMENTITIOUS UNDERLAYMENT

- A. After installation of the moisture control coating, self-leveling cementitious underlayment or trowelable cementitious skim coat can be installed:
 - 1. Apply KOSTER VAPI®06 Primer at 650 to 800 square-feet-per-gallon using a lint-free short-nap roller. Apply a thin, uniform coating over the entire cured moisture control epoxy coating. Do not dilute with water or solvent. Do not apply thicker than 650 square-feet-per-gallon.
 - 2. Mix and apply KOSTER SL standard underlayment, KOSTER SL Premium underlayment, or KOSTER SC skim coat following manufacturer's instructions. Allow to cure and dry according to manufacturer's instructions before installing floor coverings.

3.7 CLEANING

- A. Clean tools and equipment in contact with epoxy resins using xylene or other suitable cleaning agent immediately after use.

- B. Remove debris and unused materials from Project site. Dispose chemicals, rags, and other materials in accordance with applicable regulations and specific jobsite instructions.

3.8 PROTECTION

- A. Protect applications of the moisture control system during the specified cure period from traffic, topical moisture, and contaminants.
- B. Protect installed cementitious underlayment or skim coat until floor covering installation.

END OF SECTION 03 02 00

SECTION 03 10 00 CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section is related to concrete forming and accessories and includes:
 - 1. Formwork for cast-in-place concrete, with shoring, bracing, and anchorage.
 - 2. Installation of items to be embedded in concrete, such as anchor bolts, inserts, embeds, and sleeves.
 - 3. Openings for other work.
 - 4. Form accessories.
 - 5. Form stripping.
- B. Related Sections:
 - 1. Section 03 20 00: Concrete Reinforcing.
 - 2. Section 03 30 00: Cast-in-Place Concrete.
 - 3. Section 05 12 00: Structural Steel Framing.
- C. Reference Standards:
 - 1. ACI 117 Standard Specifications for Tolerances for Concrete Construction and Materials.
 - 2. ACI 301 Specifications for Structural Concrete.
 - 3. ACI 318-14 Building Code Requirements for Structural Concrete and Commentary.
 - 4. ACI 347 Guide to Formwork for Concrete.
 - 5. National Institute of Standards and Technology - PS 1 Structural Plywood.
 - 6. 2022 California Building Code, Chapter 19A.
 - 7. APA American Plywood Association Design and Construction Guide.
 - 8. Local AQMD – South Coast Air Quality Management District.

1.3 SUBMITTALS

- A. See Section 01 33 00: Submittals.
- B. Product Data: Provide data on void form materials and installation requirements.
- C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties. Review and approval will not include form strength and adequacy.
- D. Keep an accurate record of the dates of removal of forms, form shores and reshores, and furnish copies to the SEOR.

1.4 QUALITY ASSURANCE

- A. Comply with the pertinent provisions of Section 01 40 00: Quality Requirements.
- B. Construct forms according to ACI 347, "Guide to Formwork for Concrete," and conforming to

tolerances of ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with pertinent provisions of Section 01 66 10: Delivery, Storage and Materials, delivering materials in a timely manner to ensure uninterrupted progress.
- B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.

PART 2 PRODUCTS

2.1 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.
- D. Comply with relevant portions of ACI 347, ACI 301, and ACI 318.

2.2 WOOD FORM MATERIALS

- A. Softwood Plywood: PS 1, B-B Medium or High Density Concrete Form Overlay, Class I, grade marked, not mill oiled.
- B. Lumber: DF species; WCLIB Construction grade or better, WWPA No. 1 grade or better; with grade stamp clearly visible.

2.3 REMOVABLE PREFABRICATED FORMS

- A. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; two inches (2") thick.

2.4 FORMWORK ACCESSORIES

- A. Form Ties: Prefabricated rod, flat band, wire, internally threaded disconnecting type, or equal, not leaving metal within 1-1/2 inches of concrete surface.
- B. Form Release Agent:
 - 1. Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bug holes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied:
 - a. Composition: Colorless reactive, mineral oil-based, soy-based, or vegetable oil-based compound.
 - b. Do not use materials containing diesel oil or petroleum-based compounds.
 - c. VOC content: In compliance with applicable local, state, and federal regulations.

- C. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 12 00: Structural Steel Framing.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify lines, levels, and centers before proceeding with formwork. Ensure that dimensions agree with Drawings.

3.2 EARTH FORMS

- A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete. Sides of all footings and grade beams shall be formed, unless the member detail provides at least three inches (3") clear cover to reinforcement and indicates the member is cast against earth. Remove formwork prior to backfilling operations.

3.3 ERECTION - FORMWORK

- A. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Rigidly construct forms to prevent mortar leakage, sagging, displacement, or bulging between studs. Use clean, sound, approved form material, coated with specified materials only, not oil. Provide backing on all plywood joints.
- C. Coat forms with the specified resin coating, not form oil. Construct forms to exact shapes, sizes, lines, and dimensions required to obtain level, plumb, and straight surfaces. Provide openings, offsets, keys, reglets, anchorages, recesses, moldings, chamfers, blocking, screeds, drips, bulkheads, and all other required features. Make forms easily removable without hammering or prying against concrete. Space forms apart with metal spreaders. Construct forms to accurate alignment, locations, and grades, and provide against sagging, leakage of concrete mortar, or displacement occurring during and after placing of concrete. Coordinate installation of inserts and anchors in forms according to shop drawings and requirements for Work of other Sections.
- D. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- E. Corners and angles: Provide 3/4-inch by 3/4-inch beveled chamfer strips for all exposed concrete corners and angles square unless indicated otherwise.
- F. Reglets and Rebates: Form required reglets and rebates to receive frames, flashing, and other equipment. Obtain required dimensions, details, and precise positions for Work to be installed under other Sections and form concrete accordingly.
- G. Form Joints: Align joints and make watertight. Keep form joints to a minimum. Fill joints to produce smooth surfaces, intersections, and arises. Use polymer foam or equivalent fillers at joints and where forms abut or overlap existing concrete to prevent leakage of mortar.
- H. Recesses, Drips, and Profiles: Provide smooth milled wood or pre-formed rubber or plastic shapes of types shown and required.

- I. Cleanouts and Cleaning: Provide temporary openings in all wall forms and other vertical forms for cleaning and inspection. Clean forms and surfaces to receive concrete prior to placing.
- J. Re-Use: Clean and recondition form material before re-use.

3.4 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. All necessary pipe sleeves, anchors, or other required inserts shall be accurately installed as part of the work of other Sections, according to Section 03 30 00: Cast-In-Place Concrete, for submittal requirements related to this scope.
- B. Obtain approval before framing openings in structural members that are not indicated on Drawings.
- C. Provide formed openings where required for items to be embedded in passing through concrete work.
- D. Locate and set in place items that will be cast directly into concrete.
- E. Conduits or Pipes:
 - 1. Locate so as not to reduce strength of the concrete.
 - 2. Do not place pipes, other than conduits, in a slab 4-1/2 inches thick or less in any case. Conduit buried in a concrete slab shall not have an outside dimension greater than 1/3 the slab thickness nor be placed below the bottom reinforcing or over the top reinforcing.
 - 3. Sleeves: Pipe sleeves may pass through the slab or walls if not exposed to rusting or other deterioration and are of uncounted or galvanized iron or steel. Provide sleeves of diameter large enough to pass any hub or coupling on pipe, including any insulation.
 - 4. Conduits may be embedded in walls only if the outside diameter does not exceed 1/3 the wall thickness, are spaced no closer than three (3) diameters on centers, and not impair the strength of the structure.
- F. Coordinate with work of other Sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- G. Install accessories in accordance with manufacturer's instructions so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- H. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement. Heat seal joints so they are watertight.

- I. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- J. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fit so joints will not be apparent in exposed concrete surfaces.

3.6 FORM CLEANING

- A. Clean forms as erection proceeds to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.

3.7 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.
- B. Deflection: Limit deflection of forming surfaces from concrete pressure to L/240.
- C. Finish Lines:
 - 1. Position formwork to maintain hardened concrete finish lines within following permissible deviations:
 - a. Variation from plumb:

In 10'-0"	1/4 inch
In any story or 20'-0"	3/8 inch
In 40'-0" or more	3/4 inch
 - b. Variation from level or grades indicated:

In 10'-0"	1/4 inch
In any story or 20'-0"	3/8 inch
In 40'-0" or more	3/4 inch
 - c. Cross-sectional dimensions:

Minus	1/4 inch
Plus	1/2 inch

3.8 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00: Quality Requirements.
- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

3.9 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and all superimposed loads as determined by testing field cured cylinders, but not sooner than specified in ACI 347. Load supporting forms may be removed when concrete has attained 75 percent of required 28-day compressive strength, but no sooner than three (3) days, provided construction is reshored. Vertical formwork for cast-in-place concrete walls may be removed no sooner than one (1) day following concrete placement, provided that Contractor can demonstrate that no sloughing or sagging of concrete will occur:
 - 1. Reshore structural members as specified per ACI 347.
 - 2. Remove formwork progressively so unbalanced loads are not imposed on the structure.

3. Avoid damage to concrete surfaces during removal.
4. Remove formwork in same sequence as concrete placement to achieve similar concrete surface coloration.

END OF SECTION 03 10 00

SECTION 03 20 00 CONCRETE REINFORCING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section is related to concrete reinforcement and includes:
 - 1. Reinforcing steel for cast-in-place concrete foundations.
 - 2. Reinforcing steel for cast-in-place concrete slabs-on-grade.
 - 3. Supports and accessories for steel reinforcement.
- B. Related Sections:
 - 1. Section 03 10 00: Concrete Forming and Accessories.
 - 2. Section 03 30 00: Cast-in-Place Concrete.
 - 3. Section 05 12 00: Structural Steel Framing.
- C. Reference Standards:
 - 1. ACI 301 Specifications for Structural Concrete.
 - 2. ACI 318 Building Code Requirements for Structural Concrete and Commentary.
 - 3. ACI SP-066 ACI Detailing Manual.
 - 4. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - 5. ASTM A706/A706M Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
 - 6. ASTM A775/A775M Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
 - 7. ASTM D3963/D3963M Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
 - 8. AWS D1.4 Structural Welding Code - Reinforcing Steel.
 - 9. CRSI Concrete Reinforcing Steel Institute Manual of Standard Practice.
 - 10. CRSI Concrete Reinforcing Steel Institute Placing Reinforcing Bars.

1.3 SUBMITTALS

- A. See Section 01 33 00: Submittals.
- B. Shop Drawings:
 - 1. Comply with requirements of ACI SP-066. Include the following:
 - a. Complete bar layout.
 - b. Representative sections.
 - c. Details for congested conditions.
 - d. Proposed layout where vertical and horizontal bars intersect.
 - e. Bar schedules.
 - f. Typical bending diagrams and offsets.
 - g. Shapes of bent bars.
 - h. Spacing of bars.
 - i. Splice lengths and locations.

- C. Where welding is proposed:
 - 1. Detail welding to conform to AWS D1.4.
 - 2. Submit copies of welding operator's certificate.
 - 3. Where reinforcement complying with ASTM A615 is to be welded, chemical tests shall be performed to determine the weldability in accordance with ACI 318.
 - 4. Weld procedure specifications (WPS):
 - a. All WPS's shall be submitted to the Structural Engineer of Record (SEOR) for review and approval prior to use.
 - b. For WPS's that have been qualified by test, the supporting Procedure Qualification Record (PQR) shall be submitted to the SEOR for review and approval.
 - c. Included shall be WPS for repair welds.
- D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.4 QUALITY ASSURANCE

- A. Comply with the pertinent provisions of Section 01 40 00: Quality Requirements.
- B. Perform work of this Section in accordance with ACI 301.
- C. Welders' Certificates: Submit certifications for welders employed on the Project, verifying AWS qualification within the previous 12 months.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with pertinent provisions of Section 01 66 10: Delivery, Storage and Handling delivering materials in a timely manner to ensure uninterrupted progress.
- B. Bundle bars, tag with identification, and transport and store so as not to damage any material. Use metal tags indicating size, length, and other marking shown on placement drawings. Maintain tags after bundles are broken.
- C. Avoid exposure to dirt, moisture, or conditions harmful to reinforcement.
- D. Extra Material:
 - 1. Provide an allowance of an additional ten percent (10%) of the total reinforced steel tonnage in addition to the quantities shown on the Drawings. This additional steel shall be installed in sizes and locations as directed by the structural Engineer.

PART 2 PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Steel:
 - 1. ASTM A615/A615M, Grade 60 (60,000 psi):
 - a. Deformed billet-steel bars.
 - b. Unfinished.
 - c. Only to be used for conditions where bars will not be welded.
- B. Reinforcing Steel:
 - 1. ASTM A706/A706M, Grade 60 (60,000 psi) deformed low-alloy steel bars:
 - a. Unfinished.
 - b. Used in all cases where welding of bars is required.

- C. Reinforcement Accessories:
 - 1. Tie wire: ASTM A1064, annealed copper bearing steel, minimum 16 gage, 0.0508 inch.
 - 2. Chairs, bolsters, bar supports, spacers:
 - a. Sized and shaped for adequate support of reinforcement during concrete placement. Standard manufactured products shall conform to the Concrete Reinforcing Institute Manual of Standard Practice, latest edition.
 - 3. Use dense precast concrete supports with embedded wire ties for reinforcement placed on grade. Elsewhere, use wire bar supports.
- D. Welding electrodes: AWS D1.4, Table 5.1 and 5.3, low hydrogen electrodes, E8018 for Grade 60 steel.

2.2 REBAR SPLICING

- A. Coupler Systems: Mechanical devices for splicing reinforcing bars conforming to the requirements of ACI 318; capable of developing 1.25fy of the steel reinforcing yield strength in tension and compression.
- B. For reinforcement, all mechanical splices in Special Structural Walls, Special Moment Frames, and Concrete Diaphragms shall be Type 2, conforming to the requirements of ACI 318, capable of developing 1.25fy of the steel reinforcing yield strength in tension and compression, and develop the specified tensile strength of the spliced bar:
 - 1. Products:
 - a. Dayton Superior Corporation; Bar Lock Coupler System: www.daytonsuperior.com (ICC-ESR 2481).
 - b. Lenton Lock Couplers (IAPMO-ES 129).
- C. Dowel Bar Splicer with Dowel-Ins:
 - 1. Mechanical devices for connecting dowels; capable of developing full steel reinforcing design strength in tension and compression.
 - a. Products:
 - 1) Dayton Superior Corporation; Dowel Bar Splicer D101A with Straight Dowel-In: www.daytonsuperior.com.
 - 2) Lenton Form Savers (IAPMO-ES 129).

2.3 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI - Manual of Standard Practice.
- B. Bending and Forming:
 - 1. Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials.
 - 2. Do not heat reinforcement for bending.
 - 3. Bend bars No. 6 size and larger in the shop only.
 - 4. Bars with unscheduled kinks or bends are subject to rejection.
 - 5. Use only tested and approved bar materials.
- C. Welding:
 - 1. Use only ASTM A706 steel where welding is proposed:
 - a. Perform welding where shown or approved, by the direct electric arc process in accordance with AWS D1.4 using specified low hydrogen electrodes.
 - b. Preheat six inches (6") each side of joint.
 - c. Protect joints from drafts during the cooling process; accelerated cooling is

- prohibited.
 - d. Do not tack weld bars.
 - e. Welding shall not be done on or within two (2) bar diameters of any bent portion of a bar that has been bent cold.
 - f. Welding of crossing bars shall not be permitted for assembly reinforcement unless authorized by the SEOR.
 - g. Clean metal surfaces to be welded of all loose scale and foreign material.
 - h. Clean welds each time electrode is changed and chip burned edges before placing welds.
 - i. When wire brushed, the completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration to the base metal.
 - j. Cut out welds or parts of welds found defective with chisel and replace with proper welding.
 - k. Fillet welds may be considered prequalified per AWS D1.4.
 - l. Other welds are to be qualified per AWS D1.4.
- D. Where ASTM A615 steel is to be used or occurs in existing elements and is to be welded:
1. Complete chemical analyses shall be performed to determine chemical composition and, for a new bar, provided in the mill certifications to determine weldability in accordance with ACI 318 with modifications per AWS D1.4.
 2. The carbon equivalency (CE) shall be clearly defined and bars with a CE above 0.75 shall not be welded.
 3. Welding Procedure Specifications and supporting PQRs with required testing per AWS D1.4 shall be provided for review and approval prior to welding.
 4. These WPS and PQRs shall be specific to the CE as determined above, and shall, in addition to the other AWS requirement, include minimum and maximum preheat and interpass temperatures that are specified to the CE. This preheat and interpass temperature shall be strictly enforced in the field.
 5. If separate shipments of bars vary the weldability, the process listed in the above requirements shall be repeated for these new bars.
- E. Locate reinforcing splices not indicated on Drawings at point of minimum stress. Review locations of splices with SEOR.

PART 3 EXECUTION

3.1 PLACEMENT

- A. Before placing bars, and again before concrete is placed, clean bars of loose rust and/or mill scale, dirt, oil, or any other coating that may be deleterious or could reduce bond with the concrete.
- B. Securing in place:
1. Accurately place bars and wire tie in precise position where bars cross.
 2. Bend ends of wire ties away from the forms.
 3. Wire tie bars to the corners of ties and stirrups.
 4. Support bars according to the Concrete Reinforcing Steel Institute (CRSI) "Placing Reinforcing Bars," using approved accessories and chairs.
 5. Place precast concrete cubes with embedded wire ties to supporting reinforcing steel bars in concrete placed on grade and in footings.
 6. Take adequate precautions to ensure that reinforcing bar position and spacing is maintained during concrete placement.

- C. Do not displace or damage vapor barrier.
- D. Maintain concrete cover around reinforcing per requirements on Drawings.
- E. Splices:
 - 1. Do not splice reinforcing bars at the points of maximum stress except where indicated.
 - 2. Lap splices as shown or required to develop the full strength or stress of the bars.
 - 3. Stagger splices in horizontal wall bars at least 48 inches longitudinally in alternate bars and opposite faces.
- F. Field Welding: As specified for fabrication.

3.2 FIELD QUALITY CONTROL

- A. Comply with all pertinent provisions of Section 01 40 00: Quality Requirements.
- B. Supervision: Perform Work to this Section under supervision of a capable superintendent.
- C. An independent testing agency, as specified in Section 01 40 00: Quality Requirements, shall inspect installed reinforcement for conformance to Contract Documents before concrete placement.
- D. Where welding is done in the shop or at the site, perform welding of reinforcing bars under inspection of the testing laboratory welding inspector in accordance with Chapter 17 of the CBC. The welding inspector shall make a systematic record of all welds:
 - 1. Identification marks of welders.
 - 2. List of defective welds.
 - 3. Manner of correction of defects:
 - a. The welding inspector shall check the material, equipment details of construction and procedures, as well as the welds. The inspector shall check the ability of the welder. The welding inspector shall furnish the structural Engineer and the enforcement agency with a verified report that the welding required to be inspected is proper and has been done in conformity with the approved Plans and Specifications. The welding inspector shall use all means necessary to determine the quality of the weld. The inspector may use gamma ray, magnaflux, trepanning, sonics, or any other aid to visual inspection, which the inspector may deem necessary to assure the adequacy of the welding.

END OF SECTION 03 20 00

SECTION 0330 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for all concrete shown on the structural drawings, including, but not necessarily limited to, the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 1. Location of construction joints is subject to approval of the Project Architect and structural Engineer.
- F. Samples: For waterstops, vapor retarder and other construction-related products as described herein or on the drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Contractor/Subcontractor/Installer.
- B. Material Certificates: For each of the following, signed by manufacturers:
 1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.
 4. Steel reinforcement and accessories.
 5. Fiber reinforcement.
 6. Waterstops.
 7. Curing compounds.
 8. Floor and slab treatments.
 9. Bonding agents.
 10. Adhesives.
 11. Vapor retarders.
 12. Semi-rigid joint filler.
 13. Joint-filler strips.
 14. Repair materials.
- C. Material Test Reports: For the following, from a qualified testing agency retained and paid for by the Owner, indicating compliance with requirements:
 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- E. Field quality-control reports.
- F. Minutes of pre-installation conference.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency retained and paid for by the Owner, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be 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: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. Concrete Testing Service: The Owner will engage a qualified independent testing agency approved by DSA to perform material evaluation tests.
- G. 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 concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Entity responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.

2. Review shall include, but not be limited to, the following subjects as applicable to the project: special inspection and testing and inspecting agency procedures for field quality control; concrete finishes and finishing; cold- and hot-weather concreting procedures; curing procedures; construction, contraction and isolation joints and joint-filler strips; semi-rigid joint fillers; forms and form removal limitations; shoring and reshoring procedures; vapor-retarder installation; anchor rod and anchorage device installation tolerances; steel reinforcement installation; floor and slab flatness and levelness measurement; concrete repair procedures; and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement as applicable.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

- E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- G. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- H. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- I. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars where reinforcing bars are to be welded: ASTM A 706/A 706M, deformed.
- C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 or ASTM A 706/A 706M, deformed bars, assembled with clips.
- D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 1. Portland Cement: ASTM C 150, Type II
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source.
 1. Maximum Coarse-Aggregate Size: 1 inch nominal and as indicated on drawings.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

- D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
- E. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.6 WATERSTOPS

- A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified in writing by curing compound manufacturer to not interfere with bonding of floor covering.

2.8 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 or aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

- D. Epoxy Bonding Adhesive: ASTM C 881, 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, and as follows:
 - 1. Types IV and V, load bearing, for bonding freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
 - 1. Fly Ash: 15 percent.
 - 2. Combined Fly Ash and Pozzolan: 15 percent.
 - 3. Silica Fume: 10 percent.
 - 4. Combined Fly Ash, Pozzolans, and Silica Fume: 25 percent with fly ash or pozzolans not exceeding 15 percent and silica fume not exceeding 10 percent.

- C. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing, high-range water-reducing, and/or plasticizing admixtures 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.
- E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings, Foundation Walls, and Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Slump Limit: 5 inches plus or minus 1 inch.
 - 4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
 - 5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely

braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

- H. Provide $\frac{3}{4}$ " chamfer (or as otherwise directed on the drawings) at exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED 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 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."
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

- B. Clean and repair surfaces of forms to be reused in the Work. 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.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318 (ACI 318M) and ACI 301 for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B.]Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 4. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, up to amount allowed in mix design.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- C. 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. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. 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 that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view, or as otherwise directed by the Architect.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
 1. Smooth-Rubbed 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.
 2. 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 adjacent surfaces. 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.
 3. 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 adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. 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. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.11 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 ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.

- c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
- 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
- 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer, unless manufacturer certifies in writing that curing compound will not interfere with bonding of floor covering used on this Project.
- 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least **[one] [six]** month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer

according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and/or qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- 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., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 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.
3. 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.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. 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.
8. 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 one set of two specimens at 28 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.
9. 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.
10. 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.
11. 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.

12. 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.
 13. 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.
 14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 48 hours of finishing.

END OF SECTION

SECTION 04 01 23 MASONRY CLEANING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for masonry cleaning including but not limited to:
 - 1. Unit masonry surfaces.
 - 2. Accessories necessary.

1.3 DEFINITIONS

- A. Very Low Pressure Spray: Under 100 psi (690 kPa).
- B. Low Pressure Spray: 100 to 400 psi (690 to 2,750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).
- C. Medium Pressure Spray: 400 to 800 psi (2,750 to 5,510 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).
- D. High Pressure Spray: 800 to 1,200 psi (5,510 to 8,250 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

1.4 SUBMITTALS

- A. Product Data: Technical data for each type of product, including material descriptions and application instructions and test data substantiating that products comply with requirements.
- B. Preconstruction Test Reports: Submit reports for cleaning materials and methods.
- C. Cleaning program.

1.5 QUALITY ASSURANCE

- A. Paint Remover Manufacturer Qualifications: Firm having minimum five (5) years' documented experience who regularly engages in producing masonry cleaners, and with factory authorized service representatives who are available for consultation and site inspection, preconstruction product testing, and onsite assistance.
- B. Chemical Cleaner Manufacturer Qualifications: Firm having minimum five (5) years' documented experience who regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory authorized service representatives who are available for consultation and site inspection, preconstruction product testing, and onsite assistance.
- C. Cleaning Program:
 - 1. Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used; protection of surrounding materials; and control of runoff during operations. Include provisions for supervising worker performance and preventing damage:
 - a. If materials and methods other than those indicated are proposed for any phase of

cleaning work, add a written description of such materials and methods, including evidence of successful use on comparable projects and demonstrations to show their effectiveness.

- D. Mockups:
 - 1. Prepare mockups of cleaning on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution:
 - a. Clean an area approximately 25 square feet (2.3 sq. m) for each type of masonry and surface condition:
 - 1) Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not test cleaners and methods known to have deleterious effect.
 - 2) Allow a waiting period of not less than seven (7) days after completion of sample cleaning to permit a study of sample panels for negative reactions.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- E. Preconstruction Testing Service:
 - 1. Engage one (1) or more chemical cleaner and paint remover manufacturer(s) to perform preconstruction testing on masonry surfaces:
 - a. Use test areas as indicated and representative of proposed materials and existing construction.
 - b. Propose changes to materials and methods to suit.
- F. Pre-Installation Conference:
 - 1. Conduct conference at site:
 - a. Review methods and procedures related to cleaning masonry including, but not limited to, the following:
 - 1) Verify masonry cleaning equipment and facilities needed to make progress and avoid delays.
 - 2) Materials, material application, and sequencing.
 - 3) Cleaning program.
 - 4) Coordination with building occupants.

1.6 SEQUENCING AND SCHEDULING

- A. Perform masonry cleaning work in the following sequence:
 - 1. Remove plant growth.
 - 2. Inspect for open mortar joints. Where repairs are required, delay further cleaning work until after repairs are completed, cured, and dried to prevent the intrusion of water and other cleaning materials into the wall.
 - 3. Remove paint.
 - 4. Clean masonry surfaces.
 - 5. Where water repellents are to be used on or near masonry, delay application of chemicals until after cleaning.
- B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units according to masonry repair Sections. Patch holes in mortar joints according to masonry repointing Sections.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Alkaline Paste Paint Remover:
1. Alkaline paste or gel formulation for removing paint from masonry; containing no methylene chloride:
 - a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1) PROSOCO, Inc.
 - 2) Diedrich Technologies, Inc.
 - 3) EaCo Chem, Inc.
 - 4) Substitutions with Architect's approval, pursuant to conditions of Divisions 00 and 01.
- B. Cleaning Materials:
1. Water: Potable.
 2. Hot water: Water heated to a temperature of 140 degrees F to 160 degrees F (60 degrees C to 71 degrees C).
 3. Detergent solution, job mixed: Solution prepared by mixing two cups (0.5 L) of tetrasodium pyrophosphate (TSPP), 1/2 cup (125 mL) of laundry detergent, and 20 quarts (20 L) of hot water for every five gallons (20 L) of solution required.
 4. Mold, mildew, and algae remover, job mixed: Solution prepared by mixing two cups (0.5 L) of tetrasodium pyrophosphate (TSPP), five quarts (5 L) of five percent (5%) sodium hypochlorite (bleach), and 15 quarts (15 L) of hot water for every five gallons (20 L) of solution required.
 5. Nonacidic Gel Cleaner:
 - a. Gel formulation, with pH between six (6) and nine (9), that contains detergents with chelating agents, and is specifically formulated for cleaning masonry surfaces:
 - 1) Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a) PROSOCO, Inc.
 - b) Dumond Chemicals, Inc.
 - c) Price Research, Ltd.
 - d) Substitutions with Architect's approval, pursuant to conditions of Divisions 00 and 01.
 6. Nonacidic Liquid Cleaner:
 - a. Mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood:
 - 1) Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a) PROSOCO, Inc.
 - b) Diedrich Technologies, Inc.
 - c) Dumond Chemicals, Inc.
 - d) Substitutions with Architect's approval, pursuant to conditions of Divisions 00 and 01.
 7. Mild acid cleaner containing no muriatic (hydrochloric), hydrofluoric, or sulfuric acid; or ammonium bifluoride or chlorine bleaches:
 - a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1) PROSOCO, Inc.
 - 2) Diedrich Technologies, Inc.
 - 3) American Building Restoration Products, Inc.
 - 4) Substitutions with Architect's approval, pursuant to conditions of Divisions 00 and 01.
 8. Liquid, film forming, strippable masking material for protecting glass, metal, glazed masonry, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners:

- a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1) PROSOCO, Inc.
 - 2) Price Research, Ltd.
 - 3) American Building Restoration Products, Inc.
 - 4) Substitutions with Architect's approval, pursuant to conditions of Divisions 00 and 01.

2.2 CHEMICAL CLEANING SOLUTIONS

- A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended in writing by chemical cleaner manufacturer.
- B. Acidic Cleaner Solution for Non-Glazed Masonry and Unpolished Stone:
 - 1. Dilute acidic cleaner with water to produce hydrofluoric acid content of three percent (3%) or less, but not greater than that recommended in writing by chemical cleaner manufacturer:
 - a. Stones: Use only on unpolished granite, unpolished dolomite marble, and siliceous sandstone.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation when existing and forecasted weather conditions permit masonry cleaning work to be performed according to product manufacturers' written instructions and specified requirements.
- B. Clean masonry surfaces only when air temperature is 40 degrees F (4 degrees C) and above and is predicted to remain so for at least seven (7) days after completion of cleaning.

3.2 PROTECTION

- A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent paint removers and chemical cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by contact:
 - 1. Cover adjacent surfaces with materials that are proven to resist paint removers and chemical cleaners used unless products being used will not damage adjacent surfaces. Use protective materials that are waterproof and UV resistant. Apply masking agents according to manufacturer's written instructions. Do not apply liquid strippable masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
 - 2. Do not apply chemical solutions during winds of enough force to spread them to unprotected surfaces.
 - 3. Neutralize alkaline and acid wastes before disposal.
 - 4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
- B. Remove gutters and downspouts and associated hardware adjacent to immediate work area and store during masonry cleaning. Reinstall when masonry cleaning is complete:
 - 1. Provide temporary rain drainage during work to direct water away from building.

3.3 CLEANING MASONRY

- A. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 20 feet (6 m) away by Architect.
- B. Proceed with cleaning working from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.
- C. Use cleaning methods indicated for each masonry material and location:
 - 1. Brushes: Do not use wire brushes or brushes that are not resistant to chemical cleaner being used.
 - 2. Spray equipment:
 - a. Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage surfaces, including joints:
 - 1) Equip units with pressure gages.
 - 2) For chemical cleaner spray application, use low pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with nozzle having a cone shaped spray.
 - 3) For water spray application, use fan shaped spray that disperses water at an angle of 25 to 50 degrees.
 - 4) For heated water spray application, use equipment capable of maintaining temperature between 140 degrees F and 160 degrees F (60 degrees C and 71 degrees C) at flow rates indicated.
- D. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and produces an even effect without streaking or damaging masonry surfaces. Keep wall wet below area being cleaned to prevent streaking from runoff.
- E. Perform additional general cleaning, paint and stain removal, and spot cleaning of small areas that are noticeably different when viewed, so cleaned surfaces blend smoothly into surrounding areas.
- F. Water Application Methods:
 - 1. Water soak application: Soak masonry surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.
 - 2. Water spray applications: Unless otherwise indicated, hold spray nozzle at least six inches (150 mm) from masonry surface and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.
- G. Chemical Cleaner Application Methods: Apply chemical cleaners to masonry surfaces according to chemical cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi (345 kPa). Do not allow chemicals to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.
- H. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed:
 - 1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between

6.7 and 7.5.

- I. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.4 PRELIMINARY CLEANING

- A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing remaining growth to dry as long as possible before removal. Remove loose soil and plant debris from open joints to whatever depth they occur.
- B. Preliminary Cleaning:
 1. Before beginning general cleaning, remove extraneous substances that are resistant to planned cleaning methods. Extraneous substances include paint, calking, asphalt, and tar:
 - a. Carefully remove heavy accumulations of rigid materials from masonry surface with sharp chisel. Do not scratch or chip masonry surface.
 - b. Remove paint and caulking:
 - 1) Comply with requirements.
 - 2) Repeat application up to two (2) times if needed.
 - c. Remove asphalt and tar:
 - 1) Comply with requirements.
 - 2) Apply paint remover to asphalt and tar by brush without pre-wetting.
 - 3) Allow paint remover to remain on surface for ten (10) to 30 minutes.
 - 4) Repeat application if needed.

3.5 PAINT REMOVAL

- A. Paint Remover Application: Apply paint removers according to paint remover manufacturer's written instructions. Do not allow paint removers to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.
- B. Paint Removal with Alkaline Paste Paint Remover:
 1. Remove loose and peeling paint using low to medium pressure water spray, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
 2. Apply paint remover to dry, painted surface with brushes.
 3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
 4. Rinse with hot water applied by low pressure spray to remove chemicals and paint residue.
 5. Repeat process if necessary to remove all paint.
 6. Apply acidic cleaner or manufacturer's recommended afterwash to surface, while surface is still wet, using low pressure spray equipment or soft fiber brush. Let cleaner or afterwash remain on surface as a neutralizing agent for period recommended in writing by chemical cleaner or afterwash manufacturer.
 7. Rinse with cold water applied by low pressure spray to remove chemicals and soil.

3.6 CLEANING MASONRY

- A. Cold Water Soak:
 1. Apply cold water by intermittent spraying to keep surface moist.
 2. Use perforated hoses or other means that apply a fine water mist to entire surface being cleaned.

3. Apply water in cycles of five (5) minutes on and 20 minutes off.
 4. Continue spraying until surface encrustation has softened enough to permit its removal by water wash, as indicated by cleaning tests.
 5. Remove soil and softened surface encrustation from surface with cold water applied by low pressure spray.
- B. Cold Water Wash: Use cold water applied by low pressure spray.
- C. Hot Water Wash: Use hot water applied by low to medium pressure spray.
- D. Detergent Cleaning:
1. Wet surface with hot water applied by low pressure spray.
 2. Scrub surface with detergent solution using medium soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet.
 3. Rinse with hot water applied by low pressure spray to remove detergent solution and soil.
 4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.
- E. Mold, Mildew, and Algae Removal:
1. Wet surface with cold water applied by low pressure spray.
 2. Apply mold, mildew, and algae remover by brush or low pressure spray.
 3. Scrub surface with medium soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that surface remains wet.
 4. Rinse with cold water applied by low pressure spray to remove mold, mildew, and algae remover and soil.
 5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.
- F. Mild Acid Chemical Cleaning:
1. Wet surface with cold water applied by low pressure spray.
 2. Apply cleaner to surface in two (2) applications by brush or low pressure spray.
 3. Let cleaner remain on surface for period recommended in writing by chemical cleaner manufacturer.
 4. Rinse with cold water applied by low pressure spray to remove chemicals and soil.
 5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.

3.7 FINAL CLEANING

- A. Clean adjacent non-masonry surfaces of spillage and debris. Use detergent and soft brushes or cloths.
- B. Remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
- C. Remove masking materials, leaving no residues that could trap dirt.

END OF SECTION 04 01 23

SECTION 05 12 00 STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes:
 - 1. Coordinate the work of this Section with related trades.
 - 2. Verify applicable dimensions, clearances, and heights at the jobsite.
 - 3. Furnish materials and perform labor required to execute this work as indicated on the Drawings, as specified herein, and as necessary to complete the work required by Project conditions, including but not limited to:
 - a. Structural steel.
 - b. Architectural steel.
 - c. All cast-in-place bolts, nuts, plates, etc.
 - d. Ten-gauge steel or 3/4-inch plywood templates for column anchor bolts.
 - e. Field filling of holes in steel beams and columns.
 - f. Field preparation, priming, and finish painting of all exposed exterior steel:
 - 1) Field preparation, priming, and painting of interior exposed steel, including but not limited to:
 - a) Structural steel.
 - b) Exposed columns, beams, etc.
 - c) Refer to Section 09 90 00: Painting and Drawings.
 - 2) Field preparation, priming, and painting of exterior exposed steel, including but not limited to:
 - a) Structural steel.
 - b) Exposed columns, beams, etc.
 - c) Refer to Section 09 90 00: Painting and Drawings.
- B. Related Sections:
 - 1. Section 01 74 19: Construction Waste Management and Disposal.
 - 2. Section 03 30 00: Cast-In-Place Concrete.
 - 3. Section 09 90 00: Painting.
- C. Reference Standards:
 - 1. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance:
 - a. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code:
 - 1) Non-residential new construction:
 - a) All occupancy types.
 - b) First time tenant improvements.
 - 2. 2010 ADA Standards.
 - 3. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
 - 4. Refer to Specifications, including, but not limited to California Building Codes. Associations, Standards, Definitions, and Miscellaneous Requirements.
 - 5. American Institute of Steel Construction (AISC):
 - a. AISC Steel Construction Manual, including, but not limited to:
 - 1) Specification for Structural Steel Buildings, most current edition.

- 2) RCSC Specification for Structural Joints.
 - 3) Code of Standard Practice for Steel Buildings and Bridges.
- b. AISC Specifications for Architecturally Exposed Structural Steel.
- c. AISC 303.
- d. AISC 360.
- 6. American Society For Testing and Materials (ASTM):
 - a. ASTM A6 Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
 - b. ASTM A36 Standard Specification for Carbon Structural Steel.
 - c. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; Types E or S, Grade B.
 - d. ASTM A108 Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
 - e. ASTM A307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
 - f. ASTM A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - g. ASTM A327 Standard Test Methods for Impact Testing of Cast Irons.
 - h. ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; Grade B.
 - i. ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts.
 - j. ASTM A992 Standard Specification for Structural Steel Shapes.
 - k. ASTM E23 Standard Test Methods for Notched Bar Impact Testing of Metallic Materials.
 - l. ASTM E94 Standard Guide for Radiographic Examination Using Industrial Radiographic Film.
 - m. ASTM E164 Standard Practice for Contact Ultrasonic Testing of Weldments.
 - n. ASTM F436 Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.
 - o. ASTM F959 Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series.
- 7. American Welding Society (AWS):
 - a. AWS Standard Code for Arc and Gas Welding in Building Construction.
- 8. Welding Procedures Specifications (WPS).
- 9. Steel Structures Painting Council (SSPC).

1.3 SUBMITTALS

- A. Refer to Section 01 33 00: Submittal Procedures and Section 01 25 00: Substitution Procedures and Form.
- B. Submit Manufacturer's Data and Shop Drawings:
 - 1. Product data: Include laboratory test reports and other data to show compliance with Specifications (include specified standards). Include certified copies of mill reports covering chemical and physical properties of each type of structural steel.
 - 2. Shop drawings:
 - a. Shop drawings shall include, but not be limited to:
 - 1) Complete details for fabrication and assembly of structural steel members, procedures, and diagrams.
 - 2) Complete schedules for fabrication and assembly of structural steel members, procedures, and diagrams.
 - 3) Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.
 - 4) Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorage's to be installed by others.

- b. Dimensions required for locating structural steel for manufactured items such as mechanical equipment, electrical equipment, dock levelers, etc., shall be coordinated and provided by the General Contractor. General Contractor shall also coordinate and provide dimensions to locate structural steel for window or equipment supports.
- C. Submit Procedures:
 - 1. Provide weld procedures for both pre-qualified welds and special welds to be submitted to the Owner's testing laboratory and the Architect. All Group 4 and 5 shapes and plates greater than two inches (2") shall have additional weld procedures and pre-qualification by testing prior to fabrication.
 - 2. Provide installation procedure and inspection for direct tension indicator washers detailed in supplemental specifications provided by the manufacturer for approval.
 - 3. Procedures shall be submitted for both shop and field welds.
 - 4. Written description of preparation, priming, and finish painting of steel.
- D. Compliance Letter Pertaining to Primer and Painting of Steel, Extent of Work, Products, etc.:
 - 1. Refer to Section 09 90 00: Painting and Coating.
- E. Coordination:
 - 1. The following shall be provided; including, but not limited to:
 - a. General Contractor, floor framing fabricator, floor framing Installer, roof framing fabricator, roof framing installer, metal decking installer, and mechanical contractor shall coordinate the size/dimensioning and extent of all roof and floor openings for mechanical equipment, ductwork, and shafts as part of their submittal to the design team.

1.4 QUALITY ASSURANCE

- A. Refer to Section 01 40 00: Quality Requirements.
- B. AISC Group 4 and 5 shapes and built up members shall meet the requirements for joints in AISC Sections J1.7, J1.8, J2.6, and M2.2.
- C. All steel to be exposed and painted shall be repaired for an architectural finish.
- D. Performance, Testing, and Inspection:
 - 1. General:
 - a. Comply with manufacturer's standards.
 - b. Comply with state and local building codes.
 - c. Jobsite inspections shall be done as herein specified and as listed in Drawings.
 - d. Testing shall be done as herein specified and as listed in Drawings.
 - 2. Standards:

Item	Name of Test	Performance	Testing Std.
Unidentified materials	Test Lab	Refer to Structural Plans	Refer to Structural Plans
Examine seam welds of structural tubes and pipes	Special Inspection	Refer to Structural Plans	Refer to Structural Plans
Material verification	Special Inspection	Refer to Structural Plans	Refer to Structural Plans
High-strength bolts, nuts and washers	Test Lab	Refer to Structural Plans	Refer to Structural Plans

Bearing type connections	Special Inspection	Refer to Structural Plans	Refer to Structural Plans
Slip critical connections	Special Inspection	Refer to Structural Plans	Refer to Structural Plans
Non-destructive testing of partial joint penetration welds and complete joint penetration welds	Ultrasonic or magnetic particle (Test Lab)	Refer to Structural Plans	Refer to Structural Plans
Comply with Standards, Codes, Drawings, Specifications, and in accordance with agencies having jurisdiction.			
Refer to Drawings and as herein specified.			

3. Testing and inspections:
 - a. General:
 - 1) Shall comply with 2022 CBC, including but not limited to Chapter 22.
 - b. Testing laboratory:
 - 1) An inspection and testing laboratory will be selected by the Owner for testing and inspection as required by the Contract Documents.
 - 2) The selected laboratory shall conform to the requirements of ASTM E329.
 - 3) Documentary evidence of such conformance shall be submitted to the Owner.
 - c. All materials, work, methods and equipment shall be subject to inspection at the mill, fabricating plant, and at the building site:
 - 1) Material or workmanship not complying fully with the Contract Documents will not be accepted.
 - 2) The General Contractor shall give the testing laboratory reasonable notice when ready for inspection and shall supply samples and test pieces and all facilities for inspection without extra charge.
 - 3) The Owner will assume the expense of making the tests and inspection except as otherwise specified in Section 01 40 00: Quality Requirements.
 - 4) All welding and high strength bolting shall be inspected. All high strength bolts shall be sampled and tested by an independent agency.
 - d. The testing laboratory will check field fabrication for conformance to the Drawings and the referenced standards.
 - e. Testing laboratory will inspect prime paint for thickness, coverage, and compliance with Specifications.
 - f. Cost of testing and inspection:
 - 1) Costs of testing and inspection of structural steel, except as specified hereunder and in Section 01 45 23: Testing and Inspecting Services, will be paid for by the Owner
 - 2) All transportation costs and per diem living costs for inspection at fabricators' plant further than 75 miles from the jobsite will be back charged to the General Contractor.
 - 3) It is assumed that all fabrication will take place in one shop location only. All additional inspection costs will be back charged to the General Contractor.
 - 4) All mill tests and costs of re-test of plain materials shall be at the expense of the General Contractor.
 - 5) Tests required due to General Contractor's failure to provide steel identifiable in accordance with the indicated ASTM designation shall be at the expense of the General Contractor.
 - 6) Re-testing of items that failed original tests due to General Contractor's poor and/or failed construction shall be at the expense of the Contractor.
 - g. Structural steel testing and inspection:
 - 1) For shapes, plates, bars, pipe and tubing, manufacturer's certified mill test reports, and analysis for each heat will be acceptable in lieu of testing for

steel identifiable in accordance with indicated ASTM designation. Mill test reports shall indicate the physical and chemical properties of all structural steel used. Correlate individual heat numbers with each specified structural section. Tests shall also be reviewed for supplemental requirements S91 and S5 per materials in this Section.

- 2) For unidentifiable steels listed above, one (1) tension and elongation test and one (1) bend or flattening test for each five (5) tons or fractional part thereof for each size will be performed by the testing laboratory:
 - a) Comply with 2022 CBC.
- h. Welding Inspection:
 - 1) All shop and field welded operations will be inspected by a qualified welding inspector employed by the testing laboratory. Such inspector will be a person trained and thoroughly experienced in inspection of welds on work requiring unquestioned reliability. The inspector's ability to distinguish between sound and unsound welding will be reliably established.
 - 2) The welding inspector will make a systematic record of all welds. This record shall include:
 - a) Identification marks of welders.
 - b) List of defective welds.
 - c) Manner of correction of defects.
 - 3) The welding inspector will check the material, equipment, and procedure, as well as the welds. He will also check the ability of the welder. He will furnish the Architect with a report, duly verified by him, that the welding required to be inspected is proper and has been done in conformity with the Contract Documents, and that he has used all means to determine the quality of the welds.
 - 4) All full penetration groove welds will be subject to ultrasonic testing. All defective welds shall be repaired and retested with ultrasonic equipment at the General Contractor's expense.
 - 5) Column flanges: An area extending six inches (6") above and below point where girder flanges are attached will be inspected. Column flange edges will be inspected visually and entire area ultrasonically for laminations, plate discontinuities, and non-metallic inclusions.
 - 6) Ultrasonic testing will test all partial penetration groove welds.
 - 7) When ultrasonic indications arising from the weld root are interpreted as either a weld defect or the backing strip itself, the Engineer and Owner will be notified. The Owner may require the removal of backing strip. The backing strip will be removed at the expense of the General Contractor, and if no root defect is visible the weld will be retested. If no defect is indicated on this retest, and no significant amount of base and weld metal have been removed, no further repair of welding is necessary. If a defect is indicated, it will be repaired and retested at General Contractor's expense.
 - 8) The technician to evaluate the quality of the welds will calibrate the ultrasonic instrumentation.
 - 9) Other methods of inspection, for example, X-Ray, gamma ray, magnetic particle, or dye penetrant, may be used on welds if felt necessary by the inspection laboratory, and with the approval of the Owner:
 - a) Comply with 2022 CBC Chapter 17, including but not limited to Sections; 1704.3.1.
 - 10) Base metal thicker than 1-1/2 inch, when subjected to through thickness weld shrinkage strains, shall be ultrasonically inspected for discontinuities directly behind such weld before and after joint completion.
 - 11) Tests of end-welded studs:
 - a) Comply with 2022 CBC Section 1704.3.1 and AWS D1.1.
 - b) Randomly test a minimum of ten (10) studs total with a minimum of

three (3) from each heat. Physical properties shall conform to the minimums noted herein under Material Bolts.

- 12) Ultrasonic testing:
 - a) At the discretion of the Owner's testing agency, the ultrasonic testing frequency may be reduced but may not be less than the following:
 - b) Initially, all welds requiring ultrasonic testing will be tested at the rate of 100 percent in order to establish the qualifications of each individual welder. If the reject rate is demonstrated to be less than five percent (5%) of the welds tested for each welder, then the frequency of testing for that welder may be reduced to 25 percent. If the reject rate increases to five percent (5%) or more, 100 percent testing will be re-established until the rate is reduced to less than five percent (5%). The percentage of rejects will be calculated for each welder independently.
 - c) A sampling of at least 40 completed welds will be made for such reduction evaluation. Reject rate is defined as the number of welds containing rejectable defects divided by the number of welds completed. For evaluating the reject rate of continuous welds over three feet (3') in length, each 12 linear inch increment of welds, one inch (1") or less in thickness, will be considered as one (1) weld. For evaluating the reject rate of continuous welds greater than one inch (1") thickness, each six (6) linear inches will be considered one (1) weld.
- 13) See structural plans for additional inspection requirements.
- i. High strength bolting tests and inspection:
 - 1) Furnish certified test reports for each lot of bolts in accordance with Section 9 of ASTM A325:
 - a) Install bolts under the supervision of a qualified inspector in accordance with Section 9, Research Council using ASTM A325 bolts.
 - 2) Testing laboratory will visually inspect all high strength bolts for tension:
 - a) The bolts with the largest load indicator gaps (approximately ten percent [10%]) will be checked with a metal feeler gauge.
 - b) Comply with 2022 CBC Sections.
 - 3) Direct tension indicator washer testing:
 - a) Perform testing of not less than three (3) indicator washers for each diameter and grade of fastener in a calibration device capable of indicating bolt tension.
 - b) The test assembly shall include flat hardened washers, if required in the actual connection, arranged as those in the actual connections to be tensioned.
 - c) The calibration test shall demonstrate that the indicator washers indicates a tension not less than five percent (5%) greater than that required by Table 4 of the AISC Specification for Structural Joints using ASTM A325 bolts.
 - d) Manufacturer's installation procedure as required in Section 01 33 00: Submittal Procedures, shall be followed for installation of bolts in calibration device and in all connections.

1.5 WARRANTY

- A. Refer to Section 01 77 00: Closeout Procedures.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 01 60 00: Product Requirements.
- B. Store materials to permit easy access for inspection and identification:

1. Keep steel members off the ground, using pallets, platforms, or other supports.
 2. Protect steel members and packaged materials from erosion and deterioration.
- C. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Single Source Responsibility: Specified items shall be from one (1) manufacturer for each product type.
- B. Acceptable manufacturers shall be as herein listed and in Drawings:
1. Substitutions and deviations shall require Architect's approval and shall be given in letterform.
 2. Refer to Section 01 33 00: Submittal Procedures.
 3. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed Specification requirements and manufacturers specifications/recommendations.
- D. Refer to Drawings, details, and other related Specification Sections, whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

- A. Structural Steel:
1. W shapes: ASTM A992 unless indicated otherwise on Drawings.
 2. Channels and other rolled shapes: ASTM A36 unless indicated otherwise on Drawings.
 3. Plates and bars: ASTM A36 unless indicated otherwise on Drawings.
- B. AISC Group 4 and 5 shapes and plates greater than two inches (2") thick:
1. ASTM A36/ASTM A572 Grade 50 with supplementary requirements S91 Fine Austenitic Grain Size and S5 Charpy V-Notch (CVN) Impact Test.
 2. For location of CVN test, see AISC figure C-A3.1c.
 3. CVN test shall be per ASTM A673, frequency P and shall meet a minimum average value of 20 ft-lbs absorbed energy at 70°F.
 4. Elements of the moment frames only.
- C. Cold-Formed Steel Tubing: ASTM A500, Grade B.
- D. Steel Pipe: ASTM A53, Type E or S, Grade B.
- E. Anchor Bolts:
1. All anchor bolts cast in concrete shall be headed bolts with cut threads conforming to:
 - a. ASTM A307 or ASTM A36 or ASTM F1554; Grade 36, or ASTM F1554; Grade 55 as indicated on Drawings.
- F. Machine Bolts: ASTM A307.

- G. High Strength Bolts, Nuts, and Washers:
1. Bolt specifications:
 - a. Bolts shall conform to the requirements of the most current adopted edition of the Specifications of the American Society for Testing and Materials for High-Strength Bolts for Structural Steel Joints, ASTM A325, Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength, as indicated on Drawings.
 2. Bolt geometry:
 - a. Bolt dimensions shall conform to the current requirements of the American National Standards Institute for Heavy Hex Structural Bolts.
 - b. The length of bolts shall be such that the end of the bolt will be flush with or outside the face of the nut when properly installed.
 3. Nut specifications:
 - a. Nuts shall conform to the current chemical and mechanical requirements of the American Society for Testing and Materials Standard Specification for Carbon and Alloy Steel Nuts, ASTM A563.
 4. Washers:
 - a. Flat circular washers and square or rectangular beveled washers shall conform to the current requirements of the American Society for Testing and Materials Standard Specification for Hardened Steel Washers, ASTM F436.
 5. Direct tension indicator washers – ASTM F959: TurnaSure DTI (www.turnasure.com), Type 325.
 6. Tension control fastener system: Lohr (www.lohrfasteners.com), LeJeune Bolt (www.lejeunebolt.com), Nucor Fastener (www.nucor.com), or Cordova Bolt, Inc. (www.cordovabolt.com).
- H. Threaded Stud Bolts:
1. Comply with ASTM A108:
 - a. Tensile strength: 60,000 psi.
 - b. Elongation in two inches (2"): 20 percent.
 - c. Reduction of area: 50 percent.
- I. Headed Stud-Type Shear Connectors:
1. Comply with ASTM A108 Grade 1015 or 1020 cold-finished carbon steel with dimensions complying with AISC Specifications:
 - a. Tensile strength: 60,000 psi.
 - b. Elongation in two inches (2"): 20 percent.
 - c. Reduction of area: 50 percent.
- J. Provide hexagonal heads and nuts for all connections per ASTM A563, Appendix Table X1.1.
- K. Electrodes for Welding:
1. Comply with AWS Code, E70 Series minimum.
 2. Fabricator to select proper electrodes according to weld procedures as submitted.
- L. Powder Driven Fasteners:
1. Tempered steel pins with special corrosive resistant plating or coating.
 2. Pins shall have guide washers to accurately control penetration.
 3. Fastening shall be accomplished by low-velocity piston-driven power activated tool.
 4. Pins and tool shall be as manufactured by Hilti Fastening Systems (www.hilti.com).
- M. Expansion Bolts: Hilti Fastening Systems (www.hilti.com) or approved equal.
- N. Non-Shrink Grout: Refer to Section 03 30 00: Cast-In-Place Concrete.

- O. Shop Primer:
1. Primer shall be compatible with primer and finish coats for exposed steel per Section 09 90 00: Painting and Coating.
 2. Primers for concealed steel not to be painted per Section 09 90 00: Painting and Coating:
 - a. Type A material - Tnemec Company, Inc. Series 88HS Azerox H.S. Primer (www.tnemec.com):
 - 1) Exposed conditions use primer in accordance with Section 09 90 00: Painting and Coating.
 - b. Type B material - Tnemec Company, Inc. Series 90-97 Tnemec-Zinc:
 - 1) Exposed conditions use primer in accordance with Section 09 90 00: Painting and Coating.
 - c. All paints shall meet the California Air Resources Board Standards.
- P. Primers and Finish Paint: Refer to Section 09 90 00: Painting and Coating.
- Q. Hole Filler for Steel Columns and Beams: JB Weld (www.jbweld.com).

2.3 STEEL STRUCTURES PAINTING COUNCIL (SSPC)

- A. Cleaning Standards:
1. SSPC-Vis 1 Pictorial Surface Preparation Standards for Painting Steel Structures.
 2. SSPC-SP2 Hand Tool Cleaning.
 3. SSPC-SP3 Power Tool Cleaning.
 4. SSPC-SP6 Commercial Blast Cleaning.
 5. SSPC-PA2 Measurement of Dry Paint Thickness with Magnetic Gauges.
- B. Paint:
1. As herein indicated and in accordance with Section 09 90 00: Painting and Coating.
 2. Coordination of Work:
 - a. Review other Sections in which prime paints are to be provided to ensure compatibility of coatings system for various substrates.
 - b. Shop priming may be omitted if approved by Owner and covered under Section 09 90 00: Painting and Coating.
 3. Requirements of regulatory agencies: Comply with applicable rules and regulations of governing agencies for air quality control.
- C. Shop Primer:
1. All paints shall meet the California Air Resources Board Standards:
 2. Concealed steel: As herein listed.
 3. Exposed steel:
 - a. Comply with Section 09 90 00: Painting and Coating.
 - b. Shop priming may be omitted if approved by Owner and covered under Section 09 90 00: Painting and Coating.

PART 3 EXECUTION

3.1 JOB CONDITIONS

- A. All steel shall be dry and clean per paint manufacturer's recommendations as herein specified and listed in Section 09 90 00: Painting and Coating prior to field shop and/or field painting.

3.2 COORDINATION

- A. Refer to Section 01 31 00: Coordination and Project Meetings.
- B. General Contractor shall coordinate work as herein specified, in accordance with Drawings and as required to complete scope of work with all related trades.

3.3 SEQUENCING/SCHEDULING

- A. Cooperate and coordinate this work with other trades for anchor bolts, and other required inserts, templates, painting, etc.:
 - 1. Align this work prior to installation of other materials.

3.4 INSPECTION/EXAMINATION

- A. Verification of Conditions:
 - 1. Examine areas and conditions under which work is to be performed.
 - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with General Contractor to rectify.
 - 3. Do not proceed until unsatisfactory conditions are corrected.
 - 4. Proceeding with the work signifies that Contractor accepts the substrate, surfaces, and conditions, and any problems related to the substrate shall be repaired to the satisfaction of the Owner's representative without any additional cost to the Owner.

3.5 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.
- B. Protection:
 - 1. Protect finish surfaces at all times from surfaces and material adjacent to them.
 - 2. Finish work defaced with other materials on surface shall be replaced.
 - 3. Protect work under this Section from damage by other trades.

3.6 FABRICATION

- A. Exterior Steel: All exterior exposed steel shall be welded watertight to all steel including, but not limited to, steel columns, beams, outriggers, eave beams, metal decking, etc.
- B. Shop Fabrication and Assembly:
 - 1. Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated:
 - a. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
 - b. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- C. Connections: Weld or bolt shop connections, as indicated. Bolt field connections, except where welded connections or other connections are indicated.
- D. High Strength Bolts: Install in accordance with requirements for A325 and A490 slip critical and snug tight conditions as indicated on Drawings. Tighten nuts by the turn-of-the nut method or by use of a direct tension indicator. Install hardened washers in conformance with

AISC Specifications. Mark bolts that have been completely tightened with an identifying symbol. Final tightening of high strength bolts in webs of beam to column moment connection shall be performed after completion of flange welding.

- E. Install high strength bolts with snug tight type connections with threads excluded from shear plane except as otherwise noted. Holes are 1/16 inch larger unless noted otherwise in Drawings. Tighten high strength bolts to the bolt tension required by the referenced AISC standard using direct tension indicators.
- F. Unless noted otherwise, make holes 1/16 inch larger than the nominal bolt diameter unless noted otherwise in Drawings.
- G. Welding, Shop, and Field: Weld by Shielded Metal Arc Welding (SMAW) method, submerged arc method, Flux Core Arc Welding (FCAW) method, or other method approved by AWS. Perform welding in accordance with AWS Code. All welders, both manual and automatic, shall be certified in accordance with AWS "Standard Qualification Procedure" for the Work to be performed. See paragraph "welding" herein, for detailed requirements. If sizes of fillet welds are not shown on Drawings, use AWS minimum weld size but not less than 3/16-inch fillet welds.
- H. Bolt Holes for Other Work:
 - 1. Provide holes required for securing other work to structural steel framing:
 - a. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.
 - b. Cut, drill, or punch holes perpendicular to metal surfaces and remove all burrs. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
- I. High Strength Bolts:
 - 1. Installation and tightening:
 - a. Handling and storage of fasteners - Fasteners shall be protected from dirt and moisture at the jobsite. Only as many fasteners as are anticipated to be installed and tightened during a work shift shall be taken from protected storage. Fasteners not used shall be returned to protected storage at the end of the shift. Fasteners shall not be cleaned of lubricant that is present in as-delivered condition.
 - b. Tension calibrator - A tension measuring device shall be required at all jobsites where bolts in slip-critical joints are being installed and tightened. The tension measuring device shall be used to confirm (1) the suitability to satisfy the requirements of AISC for the complete fastener assembly, including lubrication if required to be used in the work, (2) calibration of wrenches, if applicable, and (3) the understanding and proper use by the bolting crew of the method to be used. The frequency of confirmation testing, the number of tests to be performed, and the test procedure shall be as specified below, as applicable. The accuracy of the tension measuring device shall be confirmed through calibration by an approved testing agency at least annually.
 - c. Joint assembly and tightening of shear/bearing connections - Bolts in connections not within the slip-critical category shall be installed in properly aligned holes, but need only be tightened to the snug tight condition. The snug tight condition is defined as the tightness that exists when all plies in a joint are in firm contact. This may be attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. If a slotted hole occurs in an outer ply, a flat hardened washer or common plate washer shall be installed over the slot.
 - d. Joint assembly and tightening of connections requiring full pre-tensioning - Slip-critical connections shall be installed in properly aligned holes and tightened by one of the following methods:
 - 1) Turn-of-nut tightening: When turn-of-nut tightening is used, hardened

washers are not required except as specified in the AISC. A representative sample of not less than three (3) bolts and nuts of each diameter, length, and grade to be used in the Work shall be checked at the start of work in a device capable of indicating bolt tension. The test shall demonstrate that the method of estimating the snug-tight condition and controlling turns from snug tight to be used by the bolting crews develops a tension not less than five percent (5%) greater than the tension required for slip-critical connections.

- 2) Installation of alternate design bolts: A representative sample of not less than three (3) bolts of each diameter, length, and grade shall be checked at the jobsite in a device capable of indicating bolt tension. The test assembly shall include flat hardened washers, if required in the actual connection, arranged as in the actual connections to be tensioned. The calibration test shall demonstrate that each bolt develops a tension not less than five percent (5%) greater than the tension required by AISC. Manufacturer's installation procedure shall be followed for installation of bolts in the calibration device and in all connections. When alternate design features of the fasteners involve an irreversible mechanism such as yield or twist-off of an element, bolts shall be installed in all holes of the connection and initially brought to a snug tight condition. All fasteners shall then be tightened, progressing systematically from the most rigid part of the connection to the free edges in a manner that will minimize relaxation of previously tightened fasteners prior to final twist-off or yielding of the control or indicator element of the individual fasteners. In some cases, proper tensioning of the bolts may require more than a single cycle of systematic tightening.
- 3) Mark bolts that have been completely tightened with an identifying symbol. Final tightening of high strength bolts in webs of beam to column moment connections shall be performed after completion of flange welding.

3.7 WELDING

- A. General:
 1. Quality of materials and design and fabrication of all welded connections shall conform to AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Building," "AWS Code for Welding in Building Construction," and requirements of this Section:
 - a. Location and type of all welds shall be as shown. Make no other welded splices, except those shown on Drawings, without prior approval of the Architect and Engineer.
- B. Exterior Steel: All exterior steel metal decking shall be welded continuous and watertight to steel connections.
- C. Automatic Welding: Use electrode wire and flux for automatic and semi-automatic welding acceptable to Architect. All methods, sequences, qualification and procedures, including preheating, and post heating if necessary, shall be detailed in writing and submitted to the Architect for review.
- D. Qualification of Welders:
 1. Structural steel welding: Manual and automatic welds for structural steel construction shall be made only by operators who have been previous qualified by tests to perform type of work required.
 2. Welders shall be checked by welding inspector. Those not doing satisfactory work may be removed and may be required to pass qualification tests again. All qualification testing shall be at the General Contractor's expense.

3. Only welders whose weld procedures and pre-qualification by testing that have passed shall be considered qualified for such welds.
- E. Control cooling process after weld is completed by either step down post heat or thermal blankets as determined by procedures and pre-qualification.
 - F. Flame cut surfaces shall be ground to remove contaminated steel layer to provide welds proper fusion without impurities.
 - G. Preparation of Surface: Surfaces to be welded shall be free of loose scale, slag, rust, grease, paint, and any other foreign material.
 - H. Welding Equipment: Welding equipment to be used in each case shall be acceptable to welding inspector. Use equipment with suitable devices to regulate speed and manually adjust operating amperage and voltage. The amperage capacity shall be sufficient to overcome line drop and to give adequate welding heat.
 - I. Remove runoffs tabs and grind surfaces smooth where the tabs would interfere with fireproofing and architectural finishes.
 - J. Automatic End-Welded Studs: Automatically end-weld in accordance with the manufacturer's recommendations in such a manner as to provide complete fusion between the end of the stud and the plates. There shall be no porosity or evidence of lack of fusion between the welded end of the stud and the plate. The stud shall decrease in length during welding approximately 1/8 inch for 5/8 inch, and 3/16 inch for 3/4-inch diameter. Stud sizes indicated on Drawings represent the finish stud height.
 - K. Welding requirements shall be as follows:
 1. The General Contractor shall be required to furnish a fabrication/erection inspector and the Owner to employ a verification inspector. Visual inspection means that the inspector visually inspects the welding for adherence to the approved weld procedure specification starting with fit-up and proceeding through the welding process. Reliance only upon use of Non-Destructive Examination (NDE) at the end of the welding should be avoided. Use visual inspection in conjunction with NDE for a sound weld.
 2. A Welding Procedure Specifications (WPS) shall be submitted to the Owner and the enforcement agency for acceptance prior to the start of work. The WPS shall be used in providing the required special inspection. The WPS shall contain the actual values to be used for the welding parameters and variable so that instruction is provided to welders; as a minimum the WPS shall list the position, electrode type, and size, travel speed, electrode stick-out, voltage and amperage with acceptable limits, bead size, weld sequence, stress relieving, and other pertinent data. A copy of the filler metal manufacturer's technical data sheet shall be submitted with each WPS. Welding consumables must be used within the positions, thickness, temperatures, and other parameters provided by the manufacturer. For WPSs requiring qualification, Procedure Qualification Records (PQRs) shall also be submitted for acceptance. Production welding heat input should be limited based on the PQR.
 3. WPSs for FCAW shall be qualified by testing. The tests shall include CVN tests to the weld metal.
 4. SMAW and FCAW, both self-shielded (FCAW-SS) and gas shielded (FCAW-G), are suitable processes.
 5. The maximum diameter for the flat and horizontal position shall be limited to 7/64 inch.
 6. Maximum width and thickness of weld layers shall be:
 - a. The thickness of a root layer shall not exceed 1/4 inch.
 - b. The maximum width of a layer in any position shall not exceed 5/8 inch.
 - c. The width of a weave bead shall not exceed three times the electrode (wire)

diameter, d, when $d > 3/32$ inch, or five times the electrode diameter when $d < 5/64$ inch.

7. The filler metal used shall have a notch toughness not less than of 20 ft-lbs as measured by a standard CVN test, ASTM E23. The CVN test temperature shall be at least 0°F. The minimum required energy absorption is 20 ft-lbs average. One (1) specimen may be less than the minimum average, but not less than 15 ft-lbs. The test shall be conducted in accordance with the applicable filler metal specification and may be performed by the manufacturer.
8. For highly restrained joints, or where shrinkage is likely to cause problems, the General Contractor shall submit a weld shrinkage and distortion control plan to the Engineer/Owner for review to determine compliance with design intent.
9. All welds shall be started and ended with a full cross section weld for a minimum length of one inch (1") on weld tabs ("run off" tabs) except at access holes in beam/girder webs. All weld tabs shall be removed, the affected area ground smooth and magnetic particle tested for defects. Minimum weld tab length shall be the greater of one inch (1") or 1.5 times the beam flange thickness but need not exceed four inches (4").
10. If backing bars are used under the bottom beam flange to column flange CJP groove weld, the backing bar shall be removed, the removal area ground to sound, bright metal and the area magnetic particle tested for defects. A reinforcing fillet weld, at least 1/4 of the bottom flange thickness but not greater than 3/8 inch, shall be placed in this location.
11. If a backing bar is used under the top beam flange to column CJP groove weld and is not removed, the backing bar shall be attached to the column and beam flanges by either a fillet weld along the complete bar length on the underside of the bar, or by a partial penetration weld from the underside of the bar, for the full length of the bar. Other methods of welding the bar to the column and beam may be used subject to the Engineer's and Owner's approval.
12. Weld dams are not allowed. Weld dams are weld tabs not aligned in such a manner to provide an extension of the joint preparation. Weld dams are typically perpendicular to proper weld tabs.
13. All tack welds shall be of the same quality as the final welds. This includes requirements for preheat. All tack welds not incorporated into the final welds shall be removed.
14. Preheat, if required by the following requirement, shall be used for all welds including tack welds. Preheat and interpass temperatures shall be determined using the hydrogen controlled method. The maximum interpass temperature shall not exceed 550 degrees. Welds for sections in ASTM A6 Shape Size Groups 4 and 5 and plates with a thickness greater than 2-1/2 inches shall have a minimum preheat of 350°F. To ensure that the work piece is properly heated, the temperature of the part shall be measured at a distance from the axis of the weld equal to twice the thickness of the thickest part being welded, but in no case less than three inches (3") in all directions, including the through thickness dimension of the part being welded, for the full length of the weld joint. Preheat shall be verified by the inspector before welding commences. The cooling rate of the weldment shall be controlled with thermal insulation or other appropriate methods to a maximum of 250°F/hr.
15. An acceptable method for installing flat reinforcing plates aligned parallel to the top or bottom flange is as follows: The reinforcing plate for the bottom flange shall be welded to the column in the fabricating shop using a complete penetration, two-sided, double joint. This weld shall be inspected by ultrasonic examination. The balance of the welding is to be done in the field. The reinforcing plate for the top flange shall be shipped loose. After the top flange has been welded to the column, ultrasonically examined, and accepted, the top flange weld surface shall be prepared, and the reinforcing plate fitted for welding to the column. The reinforcing plate shall be restrained from rotation during welding to the column. After completion of the

reinforcing plate to the column weld, the reinforcing plate shall be welded to the top flange.

16. Welders that will make welds with restricted access, such as, but not limited to, the beam bottom flange to column welds through a cope hole or access hole in the beam web, or where access to the bottom of a groove weld is restricted by the presence of a column flange, shall be qualified by the General Contractor using the same welding procedure as will be used for production and a mock-up assembly that simulates the construction configuration.
17. Mill scale shall be removed from the column in the area where the beam flange will be welded to the column.
18. General Contractor shall submit to the structural Engineer, for acceptance, a quality control or inspection plan that addresses all inspection issues, including in-process and final inspection.
19. The qualification of the General Contractor's Inspectors and NDE personnel shall be submitted to the Owner for acceptance.
20. In cases of differences of opinion between the Owner's inspector and the General Contractor's inspector regarding conformance of a weld with the Specifications, the issue shall be brought to the Owner's structural Engineer and the enforcement agency as part of the resolution process.
21. All groove welds in the girder-to-column connection shall be ultrasonically examined for the full length. Backing bar removal areas and fillet welds on continuity plates shall be examined for the full length by the magnetic particle testing (MPT) method.
22. Shear connection plates shall be sized so that they do not interfere with welders' access to make flange welds or to perform work that is required to install or remove backing or to place reinforcing fillet welds.

L. Cleaning, Priming, and Finish Painting:

1. All exterior steel and other locations indicated to be exposed or painted shall be sandblasted.
2. All interior steel shall be cleaned in accordance with SSPC guidelines:
 - a. Exposed steel shall be sandblasted for architectural appearance.

3.8 INSTALLATION/ERECTION

- A. Exterior Steel: All construction shall be modified as approved by structural Engineer and Owner for a watertight finish product including, but not limited to, metal filler putty and welding for a watertight assembly typical.
- B. Structural Steel Erection: Comply with AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Building", current adopted edition at time of permit issuance.
- C. Erection Sequence: Erect steel in accordance with special erection sequences where special erection sequences are indicated on the Contract Documents.
- D. Before and during erection, keep all structural steel clean. Ship, handle, and store steel in manner to avoid injury to members. Steel members showing evidence to rough handling or injury will be rejected.
- E. Mark each member with erection identification corresponding to mark shown on erection drawings. When marking steel in exposed conditions, the markings shall be made with easily removable chalk or similar pencil to avoid bleed through after painting. Carefully plan erection of structural steel so that no cutting and removal of material will be necessary. Do not torch burn in the field, unless specifically permitted by Engineer.
- F. Provide sufficient bracing, shoring, and guys to effect safe and satisfactory erection. Provide

bracing and shoring capable of holding steel work plumb and properly aligned while field connections are being made and until lateral force resisting elements are deemed by Architect capable of bracing structure. Temporary bracing shall be adequate to resist lateral forces from wind or seismic prior to the completion of the lateral resisting system.

- G. Set bearing and base plates with extreme care. Bring level to line and grade with leveling plates or by leveling nuts and bolts. Grout solid under plates with a flowable non-shrink grout per Section 03 30 00: Cast-In-Place Concrete prior to applying vertical loads.
- H. Field Assembly:
 - 1. Set structural framing accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment:
 - a. Level and plumb individual members of the structure within specified AISC tolerances except as noted herein.
- I. All welds shall be full and clean and conform to AISC and AWS specifications.
- J. Erection Tolerances:
 - 1. Individual pieces shall be erected so that the deviation from plumb, level, and alignment shall not exceed 1 to 500 except that:
 - a. The maximum overall height displacement of the centerline of columns at elevator shafts, from the established column line, shall not be more than one inch (1") at any point, measured from base of shaft to top of shaft.
 - b. In order to provide a true, flat plane for the exterior elevations, install all steel framing at the exterior walls of the building so that the center lines of such framing do not vary by more than one inch (1") for the length of the building.
 - c. All columns and beams shall adhere to Section M2.7 of the referenced "Specification for Structural Steel for Buildings," which states that completed members shall be free of twists, bends, and open joints. Take special care that column base plates are parallel and perpendicular to faces of columns and that bolt holes are accurately placed.
- K. Temporary Flooring:
 - 1. Provide planking and scaffolding necessary in connection with erection of structural steel, support of erection machinery, and construction materials. Temporary floors and use of steel shall be as required by applicable regulatory requirements.
 - 2. If steel decking is used as a working platform, it shall be temporarily tack-welded to supports to extent necessary for such use in accordance with applicable regulatory requirements. The concentrated loading from welding machines and other heavy machinery required for steel erection shall be distributed by planking or other approved means. Metal decking that becomes damaged as the result of being used as a working platform shall be replaced at no additional cost to the Owner.

3.9 PAINTING AND REPAIR/TREATMENT

- A. General:
 - 1. Prior to paint applications, clean all loose rust, mill scale, oil, dirt, and all other materials from all steel to be left exposed.
 - 2. Clean contact surfaces of high strength bolts of all burrs and material that might prevent solid seating of the parts.
 - 3. After erection, field touch up all welded areas, high strength bolts, and damaged areas.

For all steel to remain exposed, remove all blemishes, paint drips, and touch up prime coat.

4. After erection of steel to be exposed and painted, fill in all dimples and like defects from steel rolling and other sources prior to finishing.
 5. Shop prime all steel except the following:
 - a. Steel encased in concrete.
 - b. Contact surfaces for high strength bolts.
 - c. Areas within four inches (4") of field welds.
 - d. Steel to be fireproofed.
 - e. Surfaces to be galvanized.
 - f. Steel that will be primed and finish painted under Section 09 90 00: Painting:
 - 1) Coordinate with Section for type and schedule of painting.
- B. Exposed Interior Steelwork - When approved by Architect, use the following cleaning and priming/finish painting schedule/method:
1. Use primer and finish paint as required under Section 09 90 00: Painting.
 2. Surface preparation:
 - a. Sequence:
 - 1) First, use hand tool (SP-2) as required to assist with preparation.
 - 2) Second, use power tool (SP-3) as required to assist with preparation.
 - 3) Third, use chemical cleaning (SP-8) as required to assist with preparation.
 - 4) Fourth, use SSPC-SP6 Commercial Blast Cleaning as final preparation method.
 3. Application - Follow coating manufacturer's printed directions:
 - a. Apply two (2) shop prime coats to areas that will be inaccessible after erection.
 - b. Finish painting in field in accordance with Section 09 90 00: Painting.
 - 1) Apply finish paint to area's concealed when installed in the field.
 4. Material:
 - a. Exposed: Refer to Section 09 90 00: Painting.
 5. Number of Coats:
 - a. Exposed: Refer to Section 09 90 00: Painting.
 6. Dry Film Thickness:
 - a. Exposed: Refer to Section 09 90 00: Painting.
 7. Volume Solids:
 - a. Exposed: Refer to Section 09 90 00: Painting.
- C. Concealed Interior Steelwork - When approved by Architect, use the following cleaning and primer painting schedule/method:
1. For concealed conditions not to be finish painted, use primer paint as required under Section 09 90 00: Painting.
 2. Surface Preparation:
 - a. Sequence:
 - 1) First, use hand tool (SP-2) as required to assist with preparation.
 - 2) Second, use power tool (SP-3) as required to assist with preparation.
 - 3) Third, use chemical cleaning (SP-8) as required to assist with preparation.
 3. Application - Follow coating manufacturer's printed directions:
 - a. Apply two (2) shop prime coats to areas that will be inaccessible after erection.
 4. Material:
 - a. Exposed: Refer to Section 09 90 00: Painting.
 5. Number of Coats:
 - a. Exposed: Refer to Section 09 90 00: Painting.
 6. Dry Film Thickness:
 - a. Exposed: Refer to Section 09 90 00: Painting.
 7. Volume Solids:
 - a. Exposed: Refer to Section 09 90 00: Painting.

- D. Exposed Exterior Steelwork - When approved by Architect, use the following cleaning and priming/finish painting schedule/method:
1. Use primer and finish paint as required under Section 09 90 00: Painting.
 2. Surface Preparation:
 - a. Sequence:
 - 1) First, use hand tool (SP-2) as required to assist with preparation.
 - 2) Second, use power tool (SP-3) as required to assist with preparation.
 - 3) Third, use chemical cleaning (SP-8) as required to assist with preparation.
 - 4) Fourth, use SSPC-SP6 Commercial Blast Cleaning as final preparation method.
 - b. Fill holes for watertight assembly:
 - 1) First, weld all holes as approved by structural Engineer
 - 2) Second, holes not approved to be welded shall be filled with INDUSTRO WELD by JB Industries.
 - 3) Install in accordance with manufacturers printed instructions.
 3. Application - Follow coating manufacturer's printed directions:
 - a. Apply two (2) shop prime coats to areas that will be inaccessible after erection.
 - b. Finish painting in field in accordance with Section 09 90 00: Painting:
 - 1) Apply finish paint to area's concealed when installed in the field.
 4. Material:
 - a. Exposed: Refer to Section 09 90 00: Painting.
 5. Number of Coats:
 - a. Exposed: Refer to Section 09 90 00: Painting.
 6. Dry Film Thickness:
 - a. Exposed: Refer to Section 09 90 00: Painting.
 7. Volume Solids:
 - a. Exposed: Refer to Section 09 90 00: Painting.
- E. Concealed Exterior Steelwork - When approved by Architect, use the following cleaning and primer painting schedule/method:
1. For concealed conditions not to be finish painted, use primer paint as required under Specification Section 09 90 00: Painting or as approved alternate by Architect.
 2. Surface preparation:
 - a. Sequence:
 - 1) First, use hand tool (SP-2) as required to assist with preparation.
 - 2) Second, use power tool (SP-3) as required to assist with preparation.
 - 3) Third, use chemical cleaning (SP-8) as required to assist with preparation.
 3. Application - Follow coating manufacturer's printed directions:
 - a. Apply two (2) shop prime coats to areas that will be inaccessible after erection.
 4. Material:
 - a. Exposed: Refer to Section 09 90 00: Painting.
 5. Number of Coats:
 - a. Exposed: Refer to Section 09 90 00: Painting.
 6. Dry Film Thickness:
 - a. Exposed: Refer to Section 09 90 00: Painting.
 7. Volume Solids:
 - a. Exposed: Refer to Section 09 90 00: Painting.

3.10 HOISTING AND BRACING

- A. Provide all hoisting and erecting equipment and power.
- B. Provide and maintain any and all safety railings, toe boards, etc. required for the erection of steel framing and metal decking.

- C. Brace the erected frame in a manner that will assure safety and proper alignment to receive the metal decking and until the concrete slabs have been poured and have set.
- D. Erect building frame true and level. Erect columns in a manner to allow for movement due to welding shrinkage and thermal expansion and contraction of framing. Check plumbness after erection of each level. Maintain structural stability of frame during erection. Provide temporary bracing where necessary to maintain frame stability and to support required loads, including equipment and its operation.

3.11 PROTECTION AND CLEAN UP

- A. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- B. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades:
 - 1. Clean adjacent surfaces free of rust and oil, flux with mechanical action or solvent as necessary, avoiding damage to other materials.
- C. Perform work in accordance with manufacturer's recommendations, as herein specified, and in accordance with Drawings.
- D. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no cost to the Owner.
- E. After completion of work in this Section, remove all erection equipment and implements of service, and debris:
 - 1. Leave entire area in a neat, clean, acceptable condition.
- F. Provide guarantee/warranties and bonds as required in this Section.
- G. Provide record drawings in accordance with Section 01 77 00: Contract Closeout and Final Cleaning and Section 01 78 39: Record Documents.
- H. Closeout onsite inspection will be at the discretion of the Architect after he receives the General Contractor's notice of Certificate of Substantial Completion.

END OF SECTION 05 12 00

SECTION 05 12 13 ARCHITECTURALLY EXPOSED STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes Architecturally Exposed Structural Steel (AESS):
 - 1. Structural steel elements of special shapes and conditions requiring care for erecting.
 - 2. Architecturally structural steel detailed elements and exposed surfaces.
 - 3. Requirements in Section 05 12 00: Structural Steel Framing also apply to AESS.
- B. Related Sections:
 - 1. Section 05 12 00: Structural Steel Framing.
 - 2. Section 05 50 00: Metal Fabrications.
 - 3. Section 09 90 00: Painting.

1.3 DEFINITIONS

- A. AESS: Structural steel designated as "architecturally exposed structural steel" or "AESS" in the Contract Documents.
- B. Category 1 AESS: AESS that is within 96 inches vertically and 36 inches horizontally of a walking surface and that is visible to a person standing on that walking surface or is designated as "Category 1 architecturally exposed structural steel" or "AESS-1" in the Contract Documents.
- C. Category 2 AESS: AESS that is within 20 feet vertically and horizontally of a walking surface and that is visible to a person standing on that walking surface or is designated as "Category 2 architecturally exposed structural steel" or "AESS-2" in the Contract Documents.
- D. Category 3 AESS: AESS that is not defined as Category 1 or Category 2 or that is designated as "Category 3 architecturally exposed structural steel" or "AESS-3" in the Contract Documents or that is indicated to receive intumescent mastic fireproofing.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Show fabrication of AESS components. Shop Drawings for structural steel may be used for AESS provided items of AESS are specifically identified and requirements below are met for AESS:
 - a. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - b. Include embedment drawings.
 - c. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.

- d. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections. Indicate orientation of bolt heads.
 - e. Indicate exposed surfaces and edges and surface preparation being used.
 - f. Indicate special tolerances and erection requirements.
- B. Samples:
 - 1. Submit samples of AESS to set quality standards for exposed welds:
 - a. Two (2) steel plates, 3/8 by eight (8) by four (4) inches, with long edges joined by a groove weld and with weld ground smooth.
 - b. Steel plate, 3/8 by eight (8) by eight (8) inches, with one end of a short length of rectangular steel tube, four (4) by six (6) by 3/8 inches, welded to plate with a continuous fillet weld and with weld ground smooth and blended.
 - c. Round steel tube or pipe, minimum eight inches (8") in diameter, with end of another round steel tube or pipe, approximately four inches (4") in diameter, welded to its side at a 45-degree angle with a continuous fillet weld and with weld ground smooth and blended.
- C. Qualification Data: For installer and fabricator.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Mockups:
 - 1. Build mockups of AESS to set quality standards for fabrication and installation:
 - a. Build mockup of typical portion of AESS as shown on Drawings.
 - b. Coordinate painting requirements with Section 09 90 00: Painting.
 - c. Coordinate high-performance coatings requirements with Section 09 96 00: High Performance Coatings.
 - d. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Pre-Installation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Use special care in handling to prevent twisting, warping, nicking, and other damage. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration:
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.1 BOLTS, CONNECTORS, AND ANCHORS

- A. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies:
 - 1. Type 1, round-head assemblies, consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers:
 - a. Finish: Mechanically deposited zinc coating.
- B. Corrosion-Resisting (Weathering Steel), Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: Type 3, round-head assemblies, consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

2.2 FILLER

- A. Filler: Polyester filler intended for use in repairing dents in automobile bodies.

2.3 PRIMER

- A. Primer: Comply with Section 09 90 00: Painting.
- B. Etching Cleaner for Galvanized Metal: MPI#25.
- C. Galvanizing Repair Paint: ASTM A780/A780M.
- D. Shop Primer for Galvanized Steel: MPI#26, cementitious galvanized metal primer.

2.4 FABRICATION

- A. Shop fabricate and assemble AESS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection.
- B. In addition to special care used to handle and fabricate AESS, comply with the following:
 - 1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.
 - 2. Grind sheared, punched, and flame-cut edges of Category 1 AESS to remove burrs and provide smooth surfaces and edges.
 - 3. Fabricate Category 1 AESS with exposed surfaces free of mill marks, including rolled trade names and stamped or raised identification.
 - 4. Fabricate Category 1 and Category 2 AESS with exposed surfaces free of seams to maximum extent possible.
 - 5. Remove blemishes by filling or grinding or by welding and grinding before cleaning, treating, and shop priming.
 - 6. Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.
 - 7. Fabricate Category 1 AESS to the tolerances specified in AISC 303 for steel that is designated AESS.
 - 8. Fabricate Category 2 and Category 3 AESS to the tolerances specified in AISC 303 for steel that is not designated AESS.
 - 9. Seal-weld open ends of hollow structural sections with 3/8-inch closure plates for Category 1 AESS.
- C. Curved Members:
 - 1. Fabricate indicated members to curved shape by rolling to final shape in fabrication shop:

- a. Distortion of webs, stems, outstanding flanges, and legs of angles shall not be visible from a distance of 20 feet under any lighting conditions.
 - b. Tolerances for walls of hollow steel sections after rolling shall be approximately 1/2 inch.
- D. Coping, Blocking, and Joint Gaps: Maintain uniform gaps of 1/8 inch with a tolerance of 1/32 inch for Category 1 AESS.
- E. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- F. Cleaning Corrosion-Resisting Structural Steel: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- G. Holes:
 - 1. Provide holes required for securing other work to structural steel and for other work to pass through steel members:
 - a. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - b. Baseplate holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - c. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.5 SHOP CONNECTIONS

- A. High-Strength Bolts:
 - 1. Shop install high-strength bolts according to RCSC's Specification for Structural Joints Using ASTM F3125 Bolts for type of bolt and type of joint specified:
 - a. Joint type: Snug tightened or slip critical as indicated.
- B. Weld Connections:
 - 1. Comply with AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work, and comply with the following:
 - a. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding specified tolerances.
 - b. Use weld sizes, fabrication sequence, and equipment for AESS that limit distortions to allowable tolerances.
 - c. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where Category 1 AESS is exposed to weather.
 - d. Provide continuous welds of uniform size and profile where Category 1 AESS is welded.
 - e. Grind butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus zero inch (0") for Category 1 and Category 2 AESS.
 - f. Make butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus zero inch (0") for Category 1 and Category 2 AESS. Do not grind unless required for clearances or for fitting other components, or unless directed to correct unacceptable work.
 - g. Remove backing bars or runoff tabs; back-gouge and grind steel smooth for Category 1 and Category 2 AESS.
 - h. At locations where welding on the far side of an exposed connection of Category 1 and Category 2 AESS occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.
 - i. Make fillet welds for Category 1 and Category 2 AESS oversize and grind to uniform profile with smooth face and transition.

- j. Make fillet welds for Category 1 and Category 2 AESS of uniform size and profile with exposed face smooth and slightly concave. Do not grind unless directed to correct unacceptable work.

2.6 GALVANIZING

- A. Hot-Dip Galvanized Finish:
 - 1. Apply zinc coating by the hot-dip process to structural steel according to ASTM A123/A123M:
 - a. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 - b. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
 - c. Galvanize lintels attached to structural-steel frame and located in exterior walls.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of two inches (2").
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials.
 - 5. Galvanized surfaces.
- B. Surface Preparation for Non-Galvanized Steel:
 - 1. Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - a. SSPC-SP 2 Hand Tool Cleaning.
 - b. SSPC-SP 3 Power Tool Cleaning.
 - c. SSPC-SP 7/NACE No. 4 Brush-off Blast Cleaning.
 - d. SSPC-SP 14/NACE No. 8 Industrial Blast Cleaning.
 - e. SSPC-SP 11 Power Tool Cleaning to Bare Metal.
 - f. SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning.
 - g. SSPC-SP 10/NACE No. 2 Near-White Blast Cleaning.
 - h. SSPC-SP 5/NACE No. 1 White Metal Blast Cleaning.
 - i. SSPC-SP 8 Pickling.
- C. Preparing Galvanized Steel for Shop Priming: After galvanizing, thoroughly clean steel of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. Priming:
 - 1. Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces:
 - a. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - b. Apply two (2) coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

PART 3 EXECUTION

3.1 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

3.2 FIELD CONDITIONS

- A. Field Measurements: Where AECS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

3.3 EXAMINATION

- A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedment's for compliance with requirements:
 - 1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedment's showing dimensions, locations, angles, and elevations.
- B. Examine AECS for twists, kinks, warping, gouges, and other imperfections before erecting.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep AECS secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated:
 - 1. If possible, locate welded tabs for attaching temporary bracing and safety cabling where they will be concealed from view in the completed Work.
 - 2. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.5 ERECTION

- A. Set AECS accurately in locations and to elevations indicated and according to AISC 303 and AISC 360:
 - 1. Erect Category 1 AECS to the tolerances specified in AISC 303 for steel that is designated AECS.
 - 2. Erect Category 2 and Category 3 AECS to the tolerances specified in AISC 303 for steel that is not designated AECS.
- B. Do not use thermal cutting during erection unless approved by Architect.

3.6 FIELD CONNECTIONS

- A. High-Strength Bolts:
 - 1. Install high-strength bolts according to RCSC's Specification for Structural Joints Using ASTM F3125 Bolts for type of bolt and type of joint specified:
 - a. Joint type: Snug tightened or slip critical as indicated.
 - b. Orient bolt heads in same direction for each connection and to maximum extent possible in same direction for similar connections.
- B. Weld Connections:
 - 1. Comply with requirements in "Weld Connections" paragraph in "Shop Connections"

article:

- a. Remove backing bars or runoff tabs; back-gouge and grind steel smooth for Category 1 and Category 2 AESS.
- b. Remove erection bolts in Category 1 and Category 2 AESS, fill holes, and grind smooth.
- c. Fill weld access holes in Category 1 and Category 2 AESS and grind smooth.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect AESS as specified in Section 05 12 00: Structural Steel Framing. The testing agency is not responsible for enforcing requirements relating to aesthetic effect.
- B. Architect will observe AESS in place to determine acceptability relating to aesthetic effect.

3.8 REPAIRS AND PROTECTION

- A. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Grind steel smooth.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.
- C. Touchup Painting:
 1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces:
 - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- D. Touchup Painting: Cleaning and touchup painting are specified in Section 09 90 00: Painting and Coating.
- E. Touchup Priming: Cleaning and touchup priming are specified in Section 09 96 00: High Performance Coatings.

END OF SECTION 05 12 13

SECTION 05 31 00 STEEL DECKING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Acoustical roof deck.
 - 2. Roof deck.
 - 3. Supplementary framing for openings up to and including 18 inches.
 - 4. Bearing plates and angles.
 - 5. Acoustical insulation in roof deck flutes.
 - 6. Composite floor deck.
 - 7. Composite roof deck.
- B. Related Requirements:
 - 1. Section 03 30 00: Cast-in-Place Concrete.
 - 2. Section 05 12 00: Structural Steel Framing.
 - 3. Section 05 50 00: Metal Fabrications.
 - 4. Section 09 90 00: Painting and Coating.
- C. Reference Standards:
 - 1. American Society of Testing Materials (ASTM)
 - a. ASTM A36/A36M Standard Specification for Carbon Structural Steel.
 - b. ASTM A510/A510M Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.
 - c. ASTM B633 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
 - d. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. American Welding Society (AWS)
 - a. AWS D1.3/D1.3M Structural Welding Code - Sheet Steel.
 - 3. Factory Mutual (FM)
 - a. FM 1-28 Wind Design.
 - b. FM 1-29 Roof Deck Securement and Above-Deck Roof Components; Factory Mutual System.
 - 4. International Code Council (ICC)
 - a. ICC-ES AC43 Acceptance Criteria for Steel Deck Roof and Floor Systems.
 - b. ICC-ES AC70 Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements.
 - 5. International Accreditation Service (IAS)
 - a. IAS AC172 Accreditation Criteria for Fabricator Inspection Programs for Structural Steel.
 - 6. Steel Deck Institute (SDI)
 - a. SDI (DM) Publication No.31, Design Manual for Composite Decks, Form Decks, and Roof Decks.

1.3 PERFORMANCE REQUIREMENTS

- A. American Iron and Steel Institute (AISI) Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Fire-Resistance Ratings:
 - 1. Comply with ASTM E119: testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency:
 - a. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

1.4 SUBMITTALS

- A. See Section 01 33 00: Submittals.
- B. Product Data:
 - 1. For each type of deck, accessory, and product indicated:
 - a. Provide deck profile characteristics, dimensions, structural properties, and finishes.
- C. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- D. Welding Certificates.
- E. Product Certificates: For each type of steel deck.
- F. Product Test Reports:
 - 1. For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - a. Power-actuated mechanical fasteners.
- G. Evaluation Reports: For steel deck, from ICC-ES.
- H. Field Quality-Control Reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M "Structural Welding Code - Sheet Steel."
- C. Electrical Raceway Units: Provide UL-labeled cellular floor-deck units complying with UL 209 and listed in UL's "Electrical Construction Equipment Directory" for use with standard header ducts and outlets for electrical distribution systems.
- D. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage,

and handling.

- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation:
 - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Steel Deck:
 - 1. Verco Decking Inc; www.vercodeck.com.
 - 2. Substitutions: See Section 01 60 00: Materials and Equipment.

2.2 STEEL DECK

- A. Roof Deck - Non-composite type, steel sheet with plain vertical flute faces perforated with 1/8 inch diameter holes staggered 3/8 inch on center:
 - 1. Galvanized steel sheet: ASTM A653/A653M, structural steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
 - 2. Minimum base metal thickness: 20 gage, 0.0478 inch.
 - 3. Nominal height: 1-1/2 inch.
 - 4. Profile: FlutedPLB.
 - 5. Side joints: Interlacing lapped.
- B. Cellular Roof Deck - Non-Composite Type, Fluted Steel Sheet:
 - 1. Galvanized steel sheet: ASTM A653/A653M, structural steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
 - 2. Minimum base metal thickness: 20 gage, 0.0359 inch.
 - 3. Nominal height: 1-1/2 inch.
 - 4. Profile: Fluted PLB-CD.
 - 5. Side joints: Interlacing lapped.
- C. Cellular Roof Deck - Non-Composite Type, Fluted Steel Sheet:
 - 1. Galvanized steel sheet: ASTM A653/A653M, structural steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
 - 2. Minimum base metal thickness: 20 gage, 0.0359 inch.
 - 3. Nominal height: Three inches (3").
 - 4. Profile: Fluted PLN3-CD.
 - 5. Side joints: Interlacing lapped.

2.3 COMPOSITE FLOOR DECK

- A. Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
 - 1. Galvanized-steel sheet: ASTM A 653/A 653M, structural steel (SS), Grade 33, G60 zinc coating.
 - 2. Galvanized and shop-primed steel sheet: ASTM A 653/A 653M, structural steel (SS), Grade 33, zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer's standard gray baked-on, rust-inhibitive primer.
 - 3. Profile depth: As indicated.

4. Design uncoated-steel thickness: As indicated on Drawings.
5. Span condition: As indicated on Drawings.

2.4 COMPOSITE ROOF DECK

- A. Manufacturers are subject to compliance with requirements; provide products by the following:
 1. Verco PLB-36

2.5 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Bearing Angles: ASTM A36/A36M steel, galvanized per ASTM A123/A123M.
- C. Fasteners: Galvanized hardened steel, self-tapping.
- D. Mechanical Fasteners - Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws:
 1. Powder actuated mechanical fasteners:
 - a. Steel - with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70:
 - 1) Design requirements: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications, ICC-ES AC43, and FM DS 1-28/FM DS 1-29 wind uplift resistance.
 - 2) Material - steel; ASTM A510/A510M, Grade 1077:
 - a) Hardness: Rockwell C 54.5, minimum.
 - b) Tensile strength: 285 kips per square inch, minimum.
 - c) Shear strength: 175 kips per square inch, minimum.
 - d) Washers:
 1. Steel bar joist framing applications: 0.472-inch diameter, minimum.
 2. Mechanical fasteners - Steel; hex washer head, self-drilling, self-tapping:
 - a. Fasteners for steel roof decks protected with waterproofing membrane: ASTM B633, SC1, Type III zinc electroplate.
 - E. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
 - F. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
 - G. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
 - H. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
 - I. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
 - J. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor

deck.

- K. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- L. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- M. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with three-inch-wide (3") flanges and level recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- N. Galvanizing Repair Paint: ASTM A780/A780M.
- O. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.
- P. Sheet Metal Deck Accessories: Metal closure strips and cover plates, 18 gage, 0.0478 inch thick sheet steel; of profile and size as indicated; finished same as deck.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions prior to beginning work:
 - 1. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks:
 - 1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding,

appearance and quality of welds, and methods used for correcting welding work.

- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.
- J. On steel supports provide minimum two inch (2") bearing.
- K. Clinch lock seam side laps.
- L. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.
- M. Weld deck in accordance with AWS D1.3/D1.3M.
- N. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

3.3 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld diameter: 5/8 inch, nominal.
 - 2. Weld spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart.
 - 3. Weld spacing: Space and locate welds as indicated.
 - 4. Weld washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening:
 - 1. Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches, and as follows:
 - a. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - b. Mechanically clinch or button punch.
 - c. Fasten with a minimum of 1-1/2-inch-long welds.
- C. End Bearing:
 - 1. Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - a. End joints: Lapped two inches (2") minimum.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Prepare test and inspection reports.

3.5 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Repair Painting:
 - 1. Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint:
 - a. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
 - b. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 09 90 00: Painting.

END OF SECTION 05 31 00

SECTION 05 40 00 COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Load bearing wall framing.
 - 2. Exterior non-load bearing wall framing.
 - 3. Floor joist framing.
 - 4. Roof rafter framing.
 - 5. Ceiling joist framing.
 - 6. Soffit framing.
 - 7. Accessories necessary for a complete installation.
- B. Related Sections:
- C. Related Sections:
 - 1. Section 03 30 00: Cast in Place Concrete.
 - 2. Section 05 40 00: Cold-Formed Steel Framing.
 - 3. Section 05 50 00: Metal Fabrications.
 - 4. Section 09 90 00: Painting.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: General Contractor shall engage a qualified professional engineer, licensed in the State of California, to design cold formed steel framing.
- B. Structural Performance - Delegated design engineer shall provide cold-formed steel framing designs capable of withstanding all code required design loads within limits and under conditions indicated on the construction documents and within this Specification:
 - 1. Design loads: Designs shall be capable of withstanding the worst case loading as indicated on the structural drawings, and/or as required by the locally adopted Building Code. The design shall cover the worst case loading in all instances.
 - 2. Coordinate the requirements on the structural and architectural Drawings with the requirements of this Section. If a conflict exists, notations on the structural drawings take precedence.
 - 3. The following document governs the Work, except where more restrictive items are specified:
 - a. AISI Design of Cold-Formed Steel Structural Members Wind Load:
 - 1) Minimum design loads for exterior and/or load bearing and/or soffit applications:
 - a) As required by code officials having jurisdiction.
 - b) Deflection: 1/600 for clear simple spans.
 - c) Deflection: 1/300 for cantilever conditions and roof parapets.
 - d) Gauge: 16 gauge minimum, unless noted otherwise.
 - 2) Minimum design loads for interior and/or exterior suspended furr-downs with a maximum vertical drop on either side of five feet (5') or greater:
 - a) As required by code officials having jurisdiction.

- b) Deflection: 1/600 for clear simple spans.
 - c) Deflection: 1/300 for cantilever conditions and roof parapets.
 - d) Gauge: 20 gauge minimum, unless noted otherwise.
 - 4. It is a common practice for studs thinner than 20 gauge to be crimped and/or ribbed to increase the strength of the overall stud cross section for various loading applications. These studs are typically noted by manufacturer as "equivalent" to a thicker gauge. These "equivalent" type studs are not allowed in a vertically suspended application with greater than five feet (5') of vertical wall drop, 20 gauge is the minimum thickness allowed for these applications.
 - 5. Welding qualifications: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."
 - 6. Studs, tracks, channels, and other light gauge framing members shall conform to requirements of ASTM C955.
 - 7. Fire-rated assemblies: Where framing units are components of assemblies indicated for a fire-resistance rating, including those required for compliance with governing regulations, provide units that have been approved by governing authorities that have jurisdiction.
 - 8. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 degrees F (67 degrees C).
 - 9. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure:
 - a. Upward and downward movement of 1-1/2 inches (38 mm).
 - 10. Design exterior non-load bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold Formed Steel Framing Design Standards:
- 1. Wall studs: AISI S211.
 - 2. Headers: AISI S212.
 - 3. Lateral design: AISI S213.

1.4 SUBMITTALS

- A. Product Data: Technical data for cold formed steel framing product and accessories including factory applied primers.
- B. Shop Drawings:
 - 1. Submit layout, spacings, sizes, thickness, and types of cold formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners:
 - a. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - b. Shall bear the seal of a Registered Professional Engineer, licensed in the State of California.
- C. Supplementary Design Details: The general design is presumed adequate to permit compliance with the specified performance. Provide engineering calculations and shop drawings to supplement the general design. Calculations shall bear the seal of a Registered Professional Engineer, licensed in the State of California. Calculations and shop drawings must show design will withstand wind loading commiserate with class and rating of the Project.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. Welding qualifications:
 - a. Qualify procedures and personnel according to the following:
 - 1) AWS D1.3/D1.3M Structural Welding Code - Sheet Steel.
 - 2) CCFSS Technical Bulletin: "AISI Specification Provision for Screw Connections."
 2. Comply with AISI North American Specification for the Design of Cold Formed Steel Structural Members and Standard for Cold Formed Steel Framing - General Provisions:
 - a. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
 3. Fire resistance ratings: ASTM E119; testing by a UL. Identify products with appropriate markings of applicable testing agency. Indicate design designations from UL *Fire Resistance Directory*.
 4. Installer qualifications: Company specializing in the installation of cold formed metal framing components with minimum five (5) years' documented experience.
 5. Install system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
 6. Install system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
 7. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and galvanized-coating thickness.
- B. Professional Engineer Qualifications:
1. A professional engineer who is legally qualified to practice in the State of California and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold formed metal framing that are similar to those indicated in material, design, and extent:
 - a. Engineering responsibility: Preparation of shop drawings, design calculations, and structural data.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturers are subject to compliance with requirements; provide products by one of the following:
1. CEMCO.
 2. ClarkDietrich Building Systems.
 3. Consolidated Fabricators Corp.
 4. SCAFCO Corporation.
 5. Substitutions with Architect's approval, pursuant to conditions of Divisions 00 and 01.

2.2 LOAD BEARING WALL FRAMING

- A. Steel Studs:
 - 1. C-shaped steel studs, of web depths indicated, punched, with stiffened flanges:
 - a. Minimum base metal thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange width: 1-5/8 inches (41 mm).
 - c. Section properties: Refer to the Drawings.
- B. Steel Track:
 - 1. U-shaped steel track, of web depths indicated, unpunched, with straight flanges:
 - a. Minimum base metal thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange width: 1-1/4 inches (32 mm).
- C. Steel Box or Back-to-Back Headers:
 - 1. C-shape used to form header beams, of web depths indicated, unpunched, with stiffened flanges:
 - a. Minimum base metal thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange width: 1-5/8 inches (41 mm).
- D. Steel Single or Double L Headers:
 - 1. L-shapes used to form header beams, of web depths indicated:
 - a. Minimum base metal thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Top flange width: 1-5/8 inches (41 mm).
 - c. Section properties: Refer to the Drawings.

2.3 EXTERIOR NONLOAD BEARING WALL FRAMING

- A. Steel Studs:
 - 1. C-shaped steel studs, of web depths indicated, punched, with stiffened flanges:
 - a. Minimum base metal thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange width: 1-5/8 inches (41 mm).
 - c. Section properties: Refer to the Drawings.
- B. Steel Track:
 - 1. U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - a. Minimum base metal thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange width: 1-1/4 inches (32 mm).
- C. Vertical Deflection Clips:
 - 1. Head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web:
 - a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1) ClarkDietrich Building Systems.
 - 2) SCAFCO Corporation.
 - 3) Simpson Strong-Tie Co., Inc.
 - 4) Steeler, Inc.
 - 5) Substitutions with Architect's approval, pursuant to conditions of Divisions 00 and 01.

- D. Single Deflection Track:
1. Single, deep leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure:
 - a. Minimum base metal thickness: 0.0428 inch (1.09 mm), 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange width: One inch (25 mm) plus the design gap for one story structures and one inch (25 mm) plus twice the design gap for other applications.
- E. Double Deflection Tracks:
1. Double, deep leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges:
 - a. Outer track - Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure:
 - 1) Minimum base metal thickness: 0.0428 inch (1.09 mm), 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - 2) Flange width: One inch (25 mm) plus the design gap for one story structures and one inch (25 mm) plus twice the design gap for other applications.
 2. Inner track - of web depth indicated:
 - a. Minimum base metal thickness: 0.0428 inch (1.09 mm), 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange width: One inch (25 mm) plus the design gap for one story structures and one inch (25 mm) plus twice the design gap for other applications.
- F. Drift Clips: Bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.4 CEILING JOIST FRAMING

- A. Steel Ceiling Joists:
1. C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges:
 - a. Minimum base metal thickness: 0.0428 inch (1.09 mm).
 - b. Flange width: Two inches (51 mm), minimum.

2.5 SOFFIT FRAMING

- A. Exterior Soffit Frame:
1. C-shaped steel sections, of web depths indicated, with stiffened flanges:
 - a. Minimum base metal thickness: **0.0538 inch (1.37 mm)**.
 - b. Flange width: 1-5/8 inches (41 mm) minimum.

2.6 FRAMING ACCESSORIES

- A. Fabricate steel framing accessories from steel sheet, ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of appropriate thickness and configuration, unless otherwise indicated:
1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.

4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.
 8. Stud kickers and knee braces.
 9. Joist hangers and end closures.
 10. Hole reinforcing plates.
 11. Backer plates.
- C. Anchors, Clips, and Fasteners:
1. Steel shapes and clips: ASTM A36/A36M, zinc coated by hot dip process according to ASTM A123/A123M.
 2. Expansion anchors: Fabricated from corrosion resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488 conducted by a qualified testing agency.
 3. Power actuated anchors: Fastener system of type suitable for application indicated, fabricated from corrosion resistant materials, with allowable load capacities calculated, greater than or equal to the design load, as determined by testing per ASTM E1190 conducted by a qualified testing agency.
 4. Mechanical fasteners:
 - a. ASTM C1513, corrosion resistant coated, self-drilling, self-tapping, steel drill screws:
 - 1) Head type: Low profile head beneath sheathing.
 5. Welding electrodes: Comply with AWS standards.
- D. Miscellaneous Materials:
1. Galvanizing repair paint: SSPC-Paint 20 or ASTM A780.
 2. Non-metallic, non-shrink grout: Premixed, non-metallic, non-corrosive, non-staining grout containing selected silica sands, portland cement, shrinkage compensating agents, and plasticizing and water reducing agents, complying with ASTM C1107/C1107M, with fluid consistency and 30-minute working time.
 3. Shims: Load bearing, high density multimonomer plastic, and non-leaching; or of cold formed steel of same grade and coating as framing members supported by shims.
 4. Sealer gaskets: Closed cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

- A. Fabricate cold formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI specifications and standards, manufacturer written instructions, and specified requirements:
1. Fabricate framing assemblies using jigs or templates.
 2. Cut framing members by sawing or shearing; do not torch cut.
 3. Fasten cold formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted:
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to shop drawings, with screw penetrating joined members by no fewer than three (3) exposed screw threads.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

- C. Fabrication Tolerances:
 - 1. Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in ten (10) feet (1:960) and as follows:
 - a. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - b. Squareness: Fabricate each cold formed steel framing assembly to a maximum out of square tolerance of 1/8 inch (3 mm).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

3.2 PREPARATION

- A. Before sprayed fire resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire resistive materials, remove only as much as necessary to complete installation of cold formed framing without reducing thickness of fire resistive materials below required thickness to obtain fire resistance rating indicated. Protect remaining fire resistive materials from damage.
- C. Install load bearing shims or grout between the underside of load bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch (6 mm) to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 ERECTION

- A. General:
 - 1. Track anchors: Install anchors maximum four feet (4') on center; design anchors and spacing to carry live, dead, and wind loads.
 - 2. Track splices: Provide channel inserts or weld track splices.
 - 3. Erection: Install members plumb, level, and in a true plane.
 - 4. Fastenings: Make assembly rigid and secure, with welds free of voids and burnouts.
- B. Install metal framing systems in accordance with stud manufacturer's printed instructions.
- C. Runner Tracks:
 - 1. Install continuous tracks sized to match studs.
 - 2. Align tracks accurately to layout at base and tops of studs.
 - 3. Secure tracks as recommended by stud manufacturer, except do not exceed 24 inches on center for nail or power-driven fasteners, nor 16 inches on center for other types of attachment.
 - 4. Provide fasteners at corners and ends of tracks.
 - 5. Tracks shall be anchored to structural steel prior to installing sprayed on insulation.
 - 6. Provide deflection track (DT), at top of stud walls at floor or roof above, typically. Allow

for 1/2-inch movement of primary structure. Do not attach studs directly to deflection track.

7. Vertical deflection clips: Provide manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure.
- D. Secure studs to top track and bottom runner track by means of approved self-drilling screws or welding at both inside and outside flanges of 14 gauge or heavier material. Screws and welds shall be of sufficient size to insure strength of connection. All welding shall comply with American Welding Society "Specification for Welding Sheet Steel in Structures."
- E. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- F. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure. Use Zee clips as specified above. Weld "Z" shaped clips to structural members as shown on drawings. Maximum two feet (2') on center vertical.
- G. Install supplementary framing, blocking, and bracing in the metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with the stud manufacturer's recommendations and industry standards in each case, considering the weight or loading resulting from the item supported.
- H. Frame wall openings with extra studs, equal to the number of studs interrupted by wall openings, placed at each side of wall openings. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with shoes or by welding, and space jack studs same as full-height studs of the wall. Secure stud system all around to wall opening frame in the manner indicated.
- I. Install bracing/bridging in accordance with manufacturer's instructions and design conditions.
- J. Touch up field welds and damaged galvanized coating, except touch up of field cut studs is not required.
- K. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.
- L. Install horizontal stiffeners in stud system, space (vertical distance) at no more than 54 inches on center. Weld at each intersection.

3.4 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track:
 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).
 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers,

steel clip angles, or steel stud sections as indicated on shop drawings.

- C. Space joists not more than two inches (51 mm) from abutting walls:
 - 1. Joist spacing: 16 inches (406 mm).
- D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on shop drawings:
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on shop drawings. Fasten bridging at each joist intersection as follows:
 - 1. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold down angles, anchors, and fasteners, to provide a complete and stable joist framing assembly.

END OF SECTION 05 40 00

SECTION 05 50 00 METAL FABRICATIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Metal ladders.
 - 2. Metal Racks.
 - 3. Pipe, downspout guards.
 - 4. Handrails and brackets.
 - 5. Mechanical Curbs.
 - 6. Accessories necessary for a coordinated and complete installation.
- B. Related Sections:
 - 1. Section 03 30 00: Cast in Place Concrete.
 - 2. Section 05 40 00: Cold-Formed Steel Framing.
 - 3. Section 09 90 00: Painting.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Ladders: Provide ladders and landings capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- B. Thermal Movements:
 - 1. Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss:
 - a. Temperature change (range): 120 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C), material surfaces.

1.4 SUBMITTALS

- A. Product Data: Submit data for miscellaneous metal fabrications and paint, coatings, and grout accessories.
- B. Shop Drawings:
 - 1. Submit shop drawings detailing the 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:
 - a. For installed products indicated to comply with design loads, include structural analysis data, for information only, signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding Certificates.

- D. Paint Compatibility Certificates: Submit manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Building Code - comply with applicable provisions of the CBC California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA):
 - a. CBC Section 11B-504 where applicable.
 - 2. Welding - qualify procedures and personnel according to the following:
 - a. AWS D1.1/D1.1M Structural Welding Code – Steel.
 - b. AWS D1.2/D1.2M Structural Welding Code - Aluminum.
 - c. AWS D1.3/D1.3M Structural Welding Code - Sheet Steel.
 - d. AWS D1.6/D1.6M Structural Welding Code - Stainless Steel.
 - e. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- B. Fabricator/Installer Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project for a minimum of five (5) years, with a record of successful in-service performance, with sufficient production capacity to produce required units without causing delay in the work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store metal fabrications in a dry, well ventilated, weathertight place. Deliver and handle to prevent any type of damage to the fabricated work.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Stainless Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 304.
- D. Stainless Steel Bars and Shapes: ASTM A276, Type 304.
- E. Rolled Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
- F. Rolled Stainless Steel Floor Plate: ASTM A793.
- G. Abrasive Surface Floor Plate:
 - 1. Steel plate with abrasive granules rolled into surface or with abrasive material metallurgically bonded to steel:
 - a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1) IKG Industries, a division of Harsco Corporation.
 - 2) SlipNOT Metal Safety Flooring; W.S. Molnar Company.

- H. Steel Tubing: ASTM A500/A500M, cold formed steel tubing.
- I. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
- J. Zinc Coated Steel Wire Rope - ASTM A741:
 - 1. Wire rope fittings: Hot dip galvanized steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
- K. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.
- L. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
- M. Aluminum Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.
- N. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.
- O. Fasteners:
 - 1. Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required:
 - a. Provide stainless steel fasteners for fastening stainless steel.
 - b. Steel bolts and nuts: Regular hexagon head bolts, ASTM A307, Grade A with hex nuts, ASTM A563 and, where indicated, flat washers.
 - c. Steel bolts and nuts: Regular hexagon head bolts, ASTM A325, Type 3 with hex nuts, ASTM A 563, Grade C3 and, where indicated, flat washers.
 - d. Stainless steel bolts and nuts: Regular hexagon head annealed stainless steel bolts, ASTM F593 with hex nuts, ASTM F594 and, where indicated, flat washers; alloy.
 - e. Anchor bolts - ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 and, where indicated, flat washers:
 - 1) Hot dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
 - f. Anchors: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
 - g. Post installed anchors - per Drawings:
 - 1) Material for interior locations: Carbon steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2) Material for exterior locations and where stainless steel is indicated: ASTM F593, and nuts, ASTM F594.
 - h. Cast-in-place anchors in concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot dip galvanized per ASTM F2329.
- P. Miscellaneous Materials:
 - 1. Shop primer for ferrous metal: Universal primer, organic zinc rich primer, complying with SSPC-Paint 20 and compatible with topcoat. Provide 10-99 (red) or 10-09 (gray) by Tnemec Company.
 - 2. Universal shop primer: Fast curing, lead and chromate free, universal modified alkyd primer and compatible with topcoat. Use primer containing pigments that make it easily distinguishable from zinc rich primer.
 - 3. Water based primer: Emulsion type, anticorrosive primer for mildly corrosive

environments that is resistant to flash rusting when applied to cleaned steel and compatible with topcoat.

4. Shop primer for galvanized steel: Primer formulated for exterior use over zinc coated metal and compatible with finish paint systems indicated.
5. Galvanizing repair paint: High zinc dust content paint for regalvanizing welds in steel, complying with SSPC-Paint 20. Provide Tneme-Zinc 90-97 by Tnemec Company.
6. Bituminous paint: Cold applied asphalt emulsion complying with SSPC-Paint 12, containing no asbestos fibers, or cold applied asphalt emulsion complying with ASTM D1187.
7. Non-shrink, nonmetallic grout: Factory packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
8. Concrete materials and properties: Composed of ASTM C150 Type I Portland cement, ASTM C33 sand and coarse aggregates and potable water to produce a low slump mix suitable for placement. Grade coarse aggregate from 1/8 inch with at least 95 percent passing a 3/8-inch sieve and not more than ten percent (10%) passing a No. 8 sieve. Fill shall be proportioned to provide a minimum 28-day compressive strength of 3,000 psi (20 MPa).

2.2 FABRICATION

A. Shop Assembly:

1. Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation:
 - a. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
 - b. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
 - c. Form exposed work with accurate angles and surfaces and straight edges.
 - d. Weld corners and seams continuously to comply with the following:
 - 1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2) Obtain fusion without undercut or overlap.
 - 3) Remove welding flux immediately.
 - 4) At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - e. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
 - f. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
 - g. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
 - h. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - i. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 inch by 1-1/2 inches (3.2 mm by 38 mm), with a minimum six-inch (150 mm) embedment and two-inch (50 mm) hook, not less than eight inches (200 mm) from ends and corners of units and 24 inches (600

mm) o.c., unless otherwise indicated.

- j. Galvanize miscellaneous framing and supports at exterior locations; prime paint miscellaneous framing and supports at interior locations.

B. Miscellaneous Framing and Supports:

- 1. Provide steel framing and supports necessary to complete the work and that are not a part of the structural framework, including, but not limited to, framing and supports for overhead lobby door frames, sliding doors, countertop and vanities, ceiling hung toilet compartments, tube framing for partial height walls, and mechanical and electrical equipment:
 - k. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction. Cut, drill, and tap units to receive hardware, hangers, and similar items:
 - 1) Fabricate units from slotted channel framing where indicated.
 - 2) Furnish inserts for units installed after concrete is placed.

C. Shelf Angles:

- 1. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19 mm) bolts, spaced not more than six inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated:
 - a. Provide mitered and welded units at corners.
 - b. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately two inches (50 mm) larger than expansion or control joint.
 - c. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
 - d. Galvanize and prime shelf angles located in exterior walls.
 - e. Prime shelf angles located in exterior walls with zinc rich primer.
 - f. Furnish wedge type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.3 LADDERS

A. Ladders - Comply with ANSI A14.3. For elevator pit ladders, comply with ASME A17.1/CSA B44:

- 1. Steel ladders:
 - a. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
 - b. Siderails: Continuous, 1/2 inch by 2-1/2-inch (12.7 mm by 64 mm) steel flat bars, with eased edges.
 - c. Rungs:
 - 1) 3/4-inch (19 mm) diameter steel bars.
 - 2) Fit rungs in centerline of siderails; plug weld and grind smooth on outer rail faces.
 - 3) Provide nonslip surfaces on top of each rung, either by coating rung with aluminum oxide granules set in epoxy resin adhesive or by using a type of manufactured rung filled with aluminum oxide grout.
 - 4) Provide nonslip surfaces on top of each rung by coating with abrasive material metallurgically bonded to rung:
 - 5) Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a) Harsco Industrial IKG, a division of Harsco Corporation.
 - b) SlipNOT Metal Safety Flooring; W.S. Molnar Company.
 - d. Provide platforms as indicated fabricated from welded or pressure locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2

- inch (12 mm) in least dimension.
- e. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.
- f. Galvanize ladders, including brackets and fasteners.

2.4 METAL RACKS

- A. Pallet-Rack System: Manufacturer, Russell Industries or approved equal, Pallet-Racks and Material Handling Systems.
 - 1. Specific shapes and connections for the purpose of high-end vertical metal storage to include and not be limited to:
 - a. Where required by AHJ – Engineered system to with desired weight management. Design by licensed Engineer.
 - b. Self-supporting and leveling heavy duty metal shelving system with locking horizontal pin and slot anchoring system.
 - c. All metal surfaces to be painted.

2.5 MISCELLANEOUS STEEL TRIM

- A. Miscellaneous Steel Trim:
 - 1. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible:
 - a. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work:
 - 1) Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction, spaced not more than six inches (150 mm) from each end, six inches (150 mm) from corners, and 24 inches (600 mm) o.c.
 - 2) Galvanize miscellaneous steel trim.

2.6 PIPE, DOWNSPOUT GUARDS

- A. Fabricate pipe, downspout guards from 3/8 inch (9.5 mm) thick by 12 inch (300 mm) wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with two inch (50 mm) clearance between pipe and pipe guard. Drill each end for two (2) 3/4-inch (19 mm) anchor bolts.
- B. Galvanize and prime pipe, downspout guards.

2.7 FABRICATION TOLERANCES

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

2.8 FINISHES

- A. Finish metal fabrications after assembly.

- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.9 STEEL AND IRON FINISHES

- A. Galvanizing:
 - 1. Hot dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products:
 - a. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
- D. Preparation for Shop Priming:
 - 1. Prepare surfaces to comply with requirements indicated below:
 - a. Exterior items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - b. Items indicated to receive zinc-rich primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - c. Other items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming:
 - 1. Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting:
 - a. Stripe paint corners, crevices, bolts, welds, and sharp edges.
- F. Stainless Steel Finishes:
 - 1. Remove tool and die marks and stretch lines, or blend into finish:
 - a. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
 - b. Bright, directional polish: No. 4 finish.
 - c. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.10 EXPANDED METAL GRATINGS

- A. Provide expanded metal gratings in material, finish, style, size, thickness, weight, and type indicated or, if not indicated, as recommended by manufacturer for indicated applications and as needed to support indicated loads. Manufacturer - Indiana Grating Inc. 212 W. Douglas St, Martinsville IN 46151. Grates to comply with CBC 11B-404, for accessible route of travel:
 - 1. Material: Steel
 - 2. Steel finish: Galvanized.
 - 3. Style designation: Light Duty Welded Steel Grating, see Drawings for details.

PART 3 EXECUTION

3.1 COORDINATION

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

topcoats are compatible with one another.

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

3.2 FIELD CONDITIONS

- A. Field Measurements:
 - 1. Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication:
 - a. Established dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
 - b. Provide allowance for trimming and fitting at site.

3.3 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation, with edges and surfaces level, plumb, true, and free of rack, and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding:
 - 1. Comply with the following requirements:
 - a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - b. Obtain fusion without undercut or overlap.
 - c. Remove welding flux immediately.
 - d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection:
 - 1. Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - a. Cast aluminum: Heavy coat of bituminous paint.
 - b. Extruded aluminum: Two (2) coats of clear lacquer.

3.4 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on shop drawings.
- B. Anchor supports for overhead doors securely to, and rigidly brace from, building structure.

3.5 ERECTION TOLERANCES

- A. Maximum Variation from Plumb: 1/4 inch (6mm) per story, noncumulative.
- B. Maximum Offset from True Alignment: 1/4 inch (6mm).
- C. Maximum Out of Position: 1/4 inch (6mm).

3.6 ADJUSTING AND CLEANING

- A. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop painted surfaces:
 - a. Apply by brush or spray to provide a minimum 2.0 mil (0.05 mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 90 00: Painting.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 50 00

SECTION 05 52 00 METAL RAILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for, but is not limited to:
 - 1. Steel pipe and tube railings.
 - 2. Accessories necessary for a complete installation.
- B. Related Sections:
 - 1. Section 03 30 00: Cast-In-Place Concrete.
 - 2. Section 05 12 00: Structural Steel Framing.
 - 3. Section 05 40 00: Cold-Formed Metal Framing.
 - 4. Section 05 50 00: Metal Fabrications.
 - 5. Section 09 90 00: Painting.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Technical data for railings and the following:
 - a. Manufacturer's product lines of mechanically connected railings.
 - b. Railing brackets.
 - c. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples:
 - 1. For each type of exposed finish required:
 - a. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - b. Fittings and brackets.
 - c. Assembled sample of railing system, made from full size components, including top rail, post, handrail, and infill. Sample need not be full height:
 - 1) Show method of connection and finishing members at intersections.
- D. Delegated Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Qualification Data: For testing agency.
- F. Mill Certificates: Signed by manufacturers of stainless steel products certifying that products furnished comply with requirements.
- G. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- H. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing

agency, according to ASTM E894 and ASTM E935.

- I. Evaluation Reports: For post installed anchors, from ICC-ES.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

- 1. Accessibility requirements - comply with applicable requirements:
 - a. Americans with Disabilities Act of 1990, as amended:
 - 1) ADA Title II Regulations and the 2016 ADA Standards for Accessible Design.
 - b. California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA):
 - 1) Chapter 10 – Means of Egress:
 - a) Section 1014 Handrails.
 - b) Section 1015.3 Guards.
 - 2) CBC Section 11B-505, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
- 2. Welding qualifications - qualify procedures and personnel according to the following:
 - a. AWS D1.1/D1.1M Structural Welding Code – Steel.
 - b. AWS D1.3/D1.3M Structural Welding Code - Sheet Steel.
 - c. AWS D1.6/D1.6M Structural Welding Code - Stainless Steel.

B. Accessibility Requirements:

- 1. Railings and handrails - according to CBC Section 11B-504:
 - a. Top of handrails shall be a consistent vertical height between 34 inches and 38 inches above walking and ramp surfaces, and stair nosing.
 - b. A minimum clearance of 1-1/2 inches between handrail gripping and adjacent surfaces shall be maintained:
 - 1) Handrail may be in a recess if recess depth is a maximum of three inches (3") and there is a minimum of 18 inches clearance above the top of the handrail.
 - c. Handrail gripping shall be continuous and unobstructed. Bottoms of 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:
 - 1) Outside diameter of handrail gripping surfaces with a circular cross section shall be between 1-1/4 inches and two inches (2").
 - d. Outside diameter of handrail gripping surfaces with a non-circular cross section shall be between four inches (4") and 6-1/4 inches, with a maximum cross-sectional dimension of 2-1/4 inches.
 - e. Handrail gripping and adjacent surfaces shall be free of sharp and abrasive elements and have rounded edges.
 - f. Handrails shall be fixed and not able to rotate within their fittings.
 - g. 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.
 - h. The orientation of at least one (1) handrail shall be in the direction of the stair run, perpendicular to the direction of the stair nosing, and shall not reduce the minimum required width of the stair, in accordance with CBC Section 11B-505.2.1.
 - i. A two-inch (2") minimum high curb or barrier shall be provided to prevent the passage of a four-inch (4") diameter sphere from rolling off the edges on a ramp or landing surface. Such a curb or barrier shall be continuous and uninterrupted along the length of a ramp, in accordance with CBC Section 11B-405.9.2.

- C. Source Limitations: Obtain each type of railing from single source from single manufacturer.

1.5 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer licensed in the State of California and experienced in the design of railings, including attachment to building construction.
- B. Structural Performance:
 - 1. Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - a. Handrails and top rails of guards:
 - 1) Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - 2) Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - 3) Uniform and concentrated loads need not be assumed to act concurrently.
 - 4) Design shall comply with the CBC Live Loads Section 1607A.9 CBC. Table 1607A.1 (16).
 - b. Infill of guards:
 - 1) Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of one square foot (0.093 sq. m).
 - 2) Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements:
 - 1. Allow for thermal movements from ambient and surface temperature changes:
 - a. Temperature change: 120 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C, material surfaces).

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturers are subject to compliance with requirements; provide products by the following:
 - 1. Steel pipe and tube railings: Industrial Metal Supply Co. 1-818-729-3333.
- B. Metal Surfaces: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- C. Brackets, Flanges, and Anchors:
 - 1. Formed metal of same type of material and finish as supported rails unless otherwise indicated:
 - a. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch (38 mm) clearance from inside face of handrail to finished wall surface.
- D. Steel and Iron:
 - 1. Tubing: ASTM A500 (cold formed) or ASTM A513.
 - 2. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 3. Plates, shapes, and bars: ASTM A36/A36M.

- E. Fasteners:
1. Provide the following:
 - a. Ungalvanized steel railings: Plated steel fasteners complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5 for zinc coating.
 - b. Hot dip galvanized railings: Type 304 stainless steel or hot dip zinc coated steel fasteners complying with ASTM A153/A153M or ASTM F2329 for zinc coating.
 - c. Provide exposed fasteners with finish matching appearance, including color and texture of railings.
 - d. Fasteners for anchoring railings to other construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
 - e. Fasteners for interconnecting railing components:
 - 1) Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 - 2) Provide tamper resistant hex socket flat head machine screws for exposed fasteners unless otherwise indicated.
- F. Miscellaneous Materials:
1. Welding rods and bare electrodes: Select according to AWS specifications for metal alloy welded.
 2. Etching cleaner for galvanized metal: Complying with MPI#25.
 3. Galvanizing repair paint: High zinc dust content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
 4. Shop primer for ferrous metal: Universal primer, organic zinc rich primer, complying with SSPC-Paint 20 and compatible with topcoat. Provide 10-99 (red) or 10-09 (gray) by Tnemec Company.
 5. Universal shop primer: Fast curing, lead and chromate free, universal modified alkyd primer and compatible with topcoat. Use primer containing pigments that make it easily distinguishable from zinc rich primer.
 6. Shop primer for galvanized steel: Primer formulated for exterior use over zinc coated metal and compatible with finish paint systems indicated.
 7. Galvanizing repair paint: High zinc dust content paint for regalvanizing welds in steel, complying with SSPC-Paint 20. Provide Tneme-Zinc 90-97 by Tnemec Company.
 8. Bituminous paint: Cold applied asphalt emulsion complying with SSPC-Paint 12, containing no asbestos fibers, or cold applied asphalt emulsion complying with ASTM D1187/D1187M.
 9. Non-shrink, nonmetallic grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.2 FABRICATION

- A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with either welded or non-welded connections unless otherwise indicated.
- H. Welded Connections:
 - 1. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings:
 - a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - b. Obtain fusion without undercut or overlap.
 - c. Remove flux immediately.
 - d. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
 - 2. Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- I. Non-Welded Connections:
 - 1. Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints:
 - a. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- J. Form Changes in Direction:
 - 1. As detailed.
 - 2. Inserting prefabricated elbow fittings.
- K. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Provide wall returns at ends of wall mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- N. Brackets, Flanges, Fittings, and Anchors:
 - 1. Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated:
 - a. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

- P. For railing posts set in concrete, provide steel sleeves not less than six inches (150 mm) long with inside dimensions not less than 1/2-inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.
- Q. For removable railing posts, fabricate slip fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than 1/40 of post height. Provide socket covers designed and fabricated to resist being dislodged.
- R. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open sided floors and platforms. Fabricate to dimensions and details indicated.

2.3 FINISHES

- A. Steel and Iron Finishes:
 - 1. Galvanized railings:
 - a. Hot dip galvanize exterior steel railings, including hardware, after fabrication.
 - b. Comply with ASTM A123/A123M for hot dip galvanized railings.
 - c. Comply with ASTM A153/A153M for hot dip galvanized hardware.
 - d. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - e. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
 - 3. Preparing galvanized railings for shop priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
 - 4. For non-galvanized steel railings, provide non-galvanized ferrous metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.
 - 5. Preparation for shop priming:
 - a. Prepare uncoated ferrous metal surfaces to comply with SSPC SP6/NACE No. 3 Commercial Blast Cleaning:
 - 1) Exterior railings: SSPC SP6/NACE No. 3 Commercial Blast Cleaning.
 - 2) Railings indicated to receive zinc rich primer: SSPC SP6/NACE No. 3 Commercial Blast Cleaning.
 - 3) Other railings: SSPC SP3 Power Tool Cleaning.
 - 6. Primer application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC PA1 Shop, Field, and Maintenance Painting of Steel for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 - 7. Do not apply primer to galvanized surfaces.
 - 8. Shop painted finish - comply with Section 09 90 00: Painting:
 - a. Color and gloss: Selected by Architect.
 - 9. High performance coating:
 - a. Apply epoxy intermediate and polyurethane topcoats to prime coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC PA1 Shop, Field, and Maintenance Painting of Steel for shop painting. Apply at spreading rates recommended by coating manufacturer:
 - 1) Color and gloss: Selected by Architect.

PART 3 EXECUTION

3.1 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

3.2 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.
- B. Grade elevation review to actual conditions.

3.3 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for installer. Locate reinforcements and mark locations if not already done.

3.4 INSTALLATION

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation, measured from established lines and levels and free of rack:
 - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in three feet (2 mm in 1 m).
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).
- C. Control of Corrosion:
 - 1. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials:
 - a. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.5 RAILING CONNECTIONS

- A. Non-welded Connections: Use mechanical or adhesive joints for permanently connecting

railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip joint internal sleeve extending two inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within six inches (150 mm) of post.

3.6 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core drill holes not less than five inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.
- D. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members:
 - 1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
 - 2. For stainless steel pipe railings, weld flanges to post and bolt to supporting surfaces.
 - 3. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
- E. Install removable railing sections, where indicated, in slip fit metal sockets cast in concrete.

3.7 ATTACHING RAILINGS

- A. Anchor railing ends at walls with round flanges anchored to wall construction and to railing ends using non-welded connections.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and connected to railing ends using non-welded connections.
- C. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled in expansion shields and hanger or lag bolts.
 - 2. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
 - 3. For steel framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

3.8 ADJUSTING AND CLEANING

- A. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC PA1 requirements for touching up shop painted surfaces:
 - a. Apply by brush or spray to provide a minimum 2.0 mil (0.05 mm) dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.9 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 05 52 00

SECTION 06 10 00 ROUGH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes rough carpentry, light hardware, and miscellaneous items of work not included in another Section. This Section also includes:
 - 1. Structural wood supports, grounds, backing, and blocking required for wood framed structures including but not limited to flooring, wall, roof and ceiling construction.
 - 2. Backing/blocking for millwork and casework items that are an integral part of wall, floor, and/or ceiling construction.
 - 3. Backing/Blocking for Mechanical-Plumbing-Electrical work and equipment.
 - 4. Plywood sheathing.
- B. Related Sections:
 - 1. Section 03 10 00: Concrete Forming and Accessories.
 - 2. Section 03 30 00: Cast-In-Place Concrete.
 - 3. Section 07 92 00: Joint Sealants.
 - 4. Section 10 28 13: Restroom Accessories.
- C. Reference Standards:
 - 1. The following references, codes, and standards are hereby made a part of this Section and carpentry work shall conform to applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained in the Drawings or these Specifications shall be construed as permitting work that is contrary to code requirements:
 - a. Standard Grading and Dressing Rule #16, of the West Coast Lumber Inspection Bureau.
 - b. Grading Rules for Western Lumber of the Western Wood Products Association.
 - c. Standard Specifications for Grades of California Redwood Lumber of the Redwood Inspection Service.
 - d. American Wood Preservers Association (AWPA) Standard C 2-77 Lumber, Timbers, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes.
 - e. American Wood Preservers Bureau (AWPB) Quality Control Standards.

1.3 QUALITY ASSURANCE

- A. Lumber and plywood shall be grade or quality marked by WWPA, WCLIB, APA, AWPB, or by other grading and inspection agencies acceptable to the Architect. Grade marks shall include the designation "S-DRY"(or "MC-15" as applies) where applicable. Grade and quality marks shall not be apparent on surfaces exposed in the finished work.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store kiln dried materials in enclosed areas, protected from moisture and separated from contact with concrete or soil.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Temporary Construction: Clean lumber at Contractor's option, rough or smooth, as usage requires.
- B. Lumber Not Otherwise Specified or Noted:
 - 1. Douglas fir or larch, graded and grade-marked, according to Reference Standard 1.02 A or B, #1 grade:
 - a. Boards: Construction grade.
- C. Sill Plates (On Concrete): Construction grade light framing, pressure treated as hereinafter specified; as noted on Plans.
- D. Plywood for Walls and Roofs; As Noted On Plans:
 - 1. Unless glue type is otherwise specified, exterior plywood, interior plywood exposed to continuing moisture, and pressure treated plywood shall be fabricated with exterior glue. Plywood with interior glue shall be fully protected from soaking or continuing moisture at all times.
- E. Rough Hardware:
 - 1. Nails, spikes, bolts, screws, tacks, and framing connectors of standard manufacture as required. Hot dip galvanize items exposed to moisture or to exterior and those items that are in contact with wood pressure treated with waterborne salts:
 - a. Bolts and nuts: ASTM A307, Grade A.
 - b. Lag bolts: Fed. Spec. FF-B-561. Pre-drill per CBC.
 - c. Nails: Fed. Spec. FF-N-101, common unless otherwise noted or specified.
 - d. Joist hangers and framing connectors: Simpson or approved equal, unless otherwise noted.
 - e. Power driven fasteners: Hilti, Ramset, or approved equal, each use and fastener type subject to prior approval of Architect.
- F. Pressure Treatment (Decay and Termite Prevention):
 - 1. Pressure treat for decay and termite prevention, Douglas fir or larch wood materials that are embedded in or set against concrete.
 - 2. Treat in accordance with Reference Standard 1.02 E and quality mark as per Reference Standard 1.02 F.
 - 3. Treat with any of the following processes at Contractor option. Creosote type preservatives are not permitted:
 - a. Penta in an LPG carrier (Cellon) or Penta in Hydrocarbon Solvent-Type D (Dow Process) AWPB LP-4 quality marked.
 - b. Ammoniacal copper arsenate (ACA) or chromated copper arsenate (CCA) in a water carrier (AWPB LP-2 quality marked).
 - c. Disodium Octaborate Tetrahydrate (DOT) such as Advance Guard/Hi-bor by Osmose, Inc.
 - d. Members treated with waterborne salts shall be dried to a moisture content not exceeding 19 percent after treatment.
 - 4. Where possible, precut material before treatment.
 - 5. Holes and cutoffs and handling and storage shall be in accordance with AWPB M-4.
 - 6. Ensure that ferrous metal fastenings and items in contact with wood treated with waterborne salts are hot dip galvanized (1.25 oz. coating) where required by ICC reports.
- G. Building Paper and Felt: Kraft waterproof building paper or 15# unperforated asphalt

saturated rag felt per CBC Standard 14-1.

H. Framing Connectors: Simpson Strong Tie Corp., or equal.

2.2 MOISTURE CONTENT

A. 19 percent maximum for two times thickness and less; 19 percent maximum for thickness greater than two times and less than four times; and 22 percent maximum for thickness greater than four times.

2.3 SIZES

A. Surfaced to "DRY" sizes. Sizes noted are nominal unless shown as net.

2.4 SURFACING

A. All wood materials exposed in the finished work shall have re-sawn surfaces of clean natural color unless noted or specified otherwise. Concealed framing lumber shall be S4S.

PART 3 EXECUTION

3.1 ERECTION AND INSTALLATION

A. Framing: Conform to CBC where same covers points not indicated on Drawings. Properly lay out framing with pieces closely fitted, accurately plumbed, leveled and aligned, and rigidly secured in place.

B. Except as specifically shown on structural drawings, cutting of all wood, etc. is limited to those cuts permitted by 2022 California Building Code (CBC).

C. Bridging and Blocking: Conform to CBC. Provide two times blocking at intersections of finished surfaces for adequate bearing and at points where required to support fixtures, cabinets, hardware, and other equipment mounted on walls.

D. Plywood (General): Unless more stringent requirements are indicated on the Drawings or required by code, application of plywood shall be in accordance with recommendations of the American Plywood Association.

E. Connections and Fastenings: Conform to CBC. Unless otherwise specified or shown on the Drawings, conform to minimum nailing requirements of CBC. For bolted connections, provide washers under heads and nuts bearing on wood, and draw nuts tight. Retighten before closing in framing. Exercise care in nailing through exposed sheathing and siding and ensure that fasteners penetrate into framing members

END OF SECTION 06 10 00

SECTION 06 20 00 FINISH CARPENTRY AND MILLWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Providing all finish carpentry items including, but not limited to:
 - a. Finish carpentry.
 - b. Millwork and cabinetry.
 - c. Solid Surface Countertop.
 - d. Plastic laminate.
 - e. Casework hardware.
 - f. Miscellaneous millwork.
 - 2. Installation of:
 - a. Finish hardware.
 - b. Plastic laminate faced wood doors.
- B. Related Sections:
 - 1. Section 05 50 00: Metal Fabrications.
 - 2. Section 06 10 00: Rough Carpentry.
 - 3. Section 08 71 00: Door Hardware.
 - 4. Section 09 21 16: Gypsum Board Assemblies.
 - 5. Section 13 34 23: Pre-Engineered Modular Buildings.
- C. Reference Standards:
 - 1. Codes and references:
 - a. 2022 California Building Code Section 11B-309.
 - b. American Disabilities Act Design Guidelines (ADADG).
 - 2. American National Standards Institute:
 - a. ANSI A156.9 Cabinet Hardware.
 - b. ANSI A161.1 Woodwork Testing Standards.
 - c. ANSI A208.1 Mat-Formed Wood Particleboard.
 - 3. Woodwork Institute:
 - a. WI North American Architectural Woodwork Standards (current edition).
 - 4. National Electrical Manufacturers Association:
 - a. NEMA LD 3 High Pressure Decorative Laminates.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 - 2. Manufacturer's preprinted product information for all hardware proposed on the Project.
 - 3. Manufacturer's preprinted maintenance instructions for the casework hardware.
- B. Shop Drawings:
 - 1. Indicate size, material, and finish.

2. Show locations and installation procedures, including hardware, sinks, service fixtures, trim, and other pertinent data for each unit.
- C. Certification: Provide manufacturer's certification that casework has been fabricated and installed according to WI "Custom" Grade guidelines or better.
- D. Samples: Two (2) each, six-inch by six-inch by ¾-inch (6" x 6" x ¾") sample of specified particleboard core with grade stamp for use as verification of installed product.
- E. Closeout:
 1. Record drawings: Indicate revisions to original Drawings and shop drawings.
 2. Manufacturer contact names, addresses, and phone numbers.
 3. Finish material schedule: Names and color numbers of laminates and stains.
 4. Keys: Provide additional master key for each room and additional locksets totaling one percent (1%) of total Project for attic stock.

1.4 PERFORMANCE REQUIREMENTS

- A. Unless otherwise indicated, perform work in accordance with WI "Architectural Woodwork Standards," Custom Grade, except where specification exceeds those standards the more stringent shall govern.
- B. Fabricate millwork and cabinetry in accordance with ANSI A161.1, NEMA LD3, and general static load testing performed and certified by an independent testing agency covering the following areas of product performance, with these minimum results:
 1. Base cabinet construction/racking test: 800 pounds.
 2. Cabinet front joint loading test: 425 pounds.
 3. Wall cabinet static load test: 2,000 pounds.
 4. Drawer front joint loading test: 600 pounds.
 5. Drawer construction/static load test: 750pounds.
 6. Cabinet adjustable shelf support device/static load test: 300 pounds.
- C. Shelf Loading: Comply with loading/deflection standards of the Composite Panel Association.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a licensee of WI's Certified Compliance Program.
- B. Installer Qualifications: Licensee of WI's Certified Compliance Program.
- C. Quality Standard:
 1. Unless otherwise indicated, comply with WI's "Manual of Millwork" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements:
 - a. Before delivery to jobsite, millwork supplier:
 - 1) Licensees of WI shall issue a certified compliance certificate indicating millwork products being furnished for this Project, and certifying that these products and their installation, will fully meet requirements of grade or grades specified.
 - 2) Non-licensees of WI shall provide evidence that they have arranged for inspection by WI inspector after completion of fabrication and installation. If conditions are found to be compliant, inspector will issue Compliance

Certificate indicating millwork products being furnished for this Project and certifying that these products and their installation will fully meet requirements of grade or grades specified.

- b. Each elevation of casework and each countertop shall bear certified compliance label.
 - c. Cabinet Design Series (CDS): CDS numbers on Drawings indicate typical designs.
- D. Certified Seismic Installation Program (CSIP):
- 1. Before wood or metal stud walls are closed up, provide a written Woodwork Institute CSIP report confirming that acceptable backing is provided in all locations required for casework installation or identifying those locations where backing is missing or improperly located:
 - a. Backing shall consist of a minimum of either three by six (3 x 6) flat Douglas Fir or 16-gage 50 KSI sheet metal.
 - 2. On completion of installation, provide a Woodwork Institute CSIP Certificate identifying the work covered and certifying that installation meets the requirements of the WI CSIP attachment details and schedules.
 - 3. All fees charged by the Woodwork Institute for their CSIP are the responsibility of the millwork installer and shall be included in their bid.
- E. Pre-Installation Conference:
- 1. See Section 01 31 00: Project Management and Coordination.

1.6 WARRANTY

- A. Warranty the work specified herein for five (5) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
- B. Defects shall include but not be limited to the following:
 - 1. Rough or difficult operation, or loose or missing parts.
 - 2. Delamination of surfaces.
 - 3. Noticeable deterioration of finish.
 - 4. Warped or misaligned surfaces or telegraphing of subsurface imperfections.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver completed laminate clad casework, countertops, and related products only after wet operations in building are completed. Store in ventilated place, protected from the weather, with relative humidity range of 20 to 50 percent.
- B. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.

PART 2 PRODUCTS

2.1 MILLWORK MANUFACTURERS

- A. Woodwork Institute listed Accredited Millwork Companies, current roster and shall not preclude Contractor from using other manufacturers, provided they produce equivalent products of the type specified for the scope and size of the Project. Other manufacturers must have experience manufacturing products meeting or exceeding the specifications and must comply with the criteria performance set by the Woodwork Institute or as indicated in

Part 1 of this Section and with Division 01 requirements regarding substitutions.

2.2 MILLWORK MATERIALS

A. Plastic Laminate:

1. High-pressure decorative laminate complying with NEMA LD3, and the following requirements:
 - a. Exterior color selection available:
 - 1) Architect to select from minimum of 250 selections available, including wood grain patterns and solid colors.
 - 2) Provide five (5) different colors available per project.
 - 3) If laminate has wood grain, direction of grain shall be vertical on door, end panels, fascia panels, and exposed backs; horizontal on drawer faces, aprons, and top rails.
2. Laminate grades:
 - a. Exposed doors, finished end panels, and other vertical surfaces: GP28 (0.028 inch thick nominal)
 - b. Horizontal surfaces other than top: GP28 (0.028 inch thick nominal)
 - c. Cabinet liner: CL20 (0.020-inch nominal), white.
 - d. Work surfaces and countertops: GP50 (0.050-inch thick nominal) with BK20 (0.20-inch thick) backer sheet.
 - e. Backsplash: PH42 (0.042 inch nominal) with nominally balanced backer sheet.
3. Adhesive: PVA water resistant adhesive. Contact adhesives not permitted.
4. Pressure fused laminate:
 - a. NEMA LD3 VGL, and NEMA LD3 CLS, melamine resin impregnated, 120-gram PSM minimum, thermofused to core under pressure.
 - b. Color:
 - 1) Closed interiors, underside of wall cabinets: White.
 - 2) Exposed and semi-exposed open cabinets: Match exterior.
 - c. Provide balanced construction with same thermofused melamine. Unsurfaced coreboard or simple backers not allowed.

B. Core Material:

1. Particleboard: ANSI 208.1, Grade M-2-Exterior Glue.
2. Medium-density fiberboard: ANSI A208.2, Grade MD.
3. Plywood: Shop sanded, exterior grade veneer cored, hardwood faced, any species, with no defects affecting strength or utility. Overlay plywood not permitted. Plywood allowed at countertops and toe-base only.
4. Water resistant treated plywood shall have 24-hour thickness swell factor of five percent (5%) or less and 24-hour water absorption factor of ten percent (10%) or less; P.S. 51, Type II or better.
5. Cabinet components shall be of the following minimum core thicknesses:
 - a. Cabinet backs, drawer body, and drawer bottoms: ½-inch particleboard.
 - b. Door and drawer face, base, wall, and tall cabinet tops and bottoms, cabinet sides, drawer spreaders, cabinet back rear hangstrips, structural dividers, and exposed cabinet backs: ¾-inch particleboard.
 - c. Work surfaces and countertops: Minimum one-inch (1") particleboard or plywood, except use water resistant treated plywood core at counters with sinks.
 - d. Shelves: ¾-inch particleboard core for 30 inches long or less, one-inch (1") thick particleboard core for more than 30 inches long; 14-inch deep, unless otherwise noted. Provide vertical dividers for shelves over 36 inches long.
 - e. Cabinet toe-base: ¾-inch plywood. No particleboard within four inches (4") of floor.

C. Countertops - WI Premium Grade: Where indicated on Drawings.

1. Solid Surface:
 - a. Solid surfacing material thickness: $\frac{3}{4}$ -inch (19 mm).
 - b. Backsplash to match countertops, min 4 inches unless otherwise indicated on Drawings.
 - c. Colors, patterns, and finishes: Provide materials and products resulting in colors of solid surfacing material indicated on Drawings.
 2. Fabrication:
 - a. Fabricate tops in one piece, unless otherwise indicated. Comply with solid surfacing material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing:
 - 1) Fabricate tops with shop applied edges of materials and configuration indicated.
 - 2) Fabricate tops with loose backsplashes for field application.
 - b. Drill holes in countertops for plumbing fittings and soap dispensers in shop.
 3. Countertop construction tolerances:
 - a. Variation from plumb: For vertical lines and surfaces, do not exceed 1/16 inch in 48 inches (1.5 mm in 1,200 mm).
 - b. Variation from level: Do not exceed 1/8 inch in 96 inches (3 mm in 2,400 mm), 1/4-inch (6 mm) maximum.
 - c. Variation in joint width: Do not vary joint thickness more than 1/4 of nominal joint width.
 - d. Variation in plane at joints (lipping): Do not exceed 1/64-inch (0.4 mm) difference between planes of adjacent units.
 - e. Variation in line of edge at joints (lipping): Do not exceed 1/64-inch (0.4-mm) difference between edges of adjacent units, where edge line continues across joint.
- D. Countertops and Backsplashes:
1. Countertops: Where indicated on Drawings; provide countertops with rolled edges in as long as practical continuous lengths. Provide field glued splines at joints. No joints closer than 24 inches either side of sink cutout.
 2. Backsplash: Integral to countertop, four inches (4") high unless otherwise shown. Fabricate with single continuous sheet of laminate from front counter to top of splash with no joints from horizontal to vertical application. No joints shall occur at sink openings.
 3. At exposed countertop end corners, provide one-inch (1") radius, or similar safety treatment.
- E. Toe Spaces: Leave toe spaces unfinished for installation of resilient base, unless otherwise shown.
- F. End Panels and Filler Strips: Match adjacent case-piece.
- G. Edging:
1. Provide the following in accordance with "Edging Locations:"
 - a. Flat edge PVC: 0.020 inch. Solid, high-impact, purified, color-thru, acid resistant, machine-applied with hot melt adhesives.
 - b. Three-millimeter (3 mm) PVC: Solid, high-impact, purified, color-thru, acid resistant, pre-lamination primed edging, machine-applied with hot melt adhesives, and machine profiled to 1/8-inch radius.
 2. Edging locations:
 - a. Cabinet body edge, including door/drawer front spacer rail: Flat edge PVC, color matched to door/drawer face or as selected.
 - b. Forward edge of interior body components, interior dividers, shelf, and top edges of drawer body: Flat edge PVC to match cabinet interior surface color.
 - c. Door/drawer-front edging: Three-millimeter (3 mm) PVC, color matched to standard

laminates.

2.3 CABINET HARDWARE

- A. All hardware shall meet ANSI A156.9 and shall be subject to approval by the Architect. All keying shall match existing master key system and be approved by the Owner:
 - 1. Acceptable manufacturers:
 - a. Knappe & Vogt.
 - b. As specified herein, provide specified product, or Architect approved equal.
- B. Hinges:
 - 1. Heavy duty, five-knuckle 2-3/4-inch institutional type hinge shall meet ANSI/BHMA A156.9 Grade 1 requirements. Mill ground, hospital tip, Teflon coated tight pin feature with all edges eased. Hinge shall be full wrap around type of tempered steel 0.095 inch thick. Each hinge shall have minimum of nine (9) screws, #7, 5/8-inch FHMS to assure positive door attachment.
 - 2. One (1) pair per door to 48 inches height. 1-1/2 pair over 48 inches in height. Hinge shall accommodate 13/16 thick laminated door and allow 270-degree swing.
 - 3. Finish: US26D.
- C. Pulls: Wire design, four inches (4"), satin chrome, US26D finish.
- D. Sliding Door Hardware:
 - 1. Frameless 1/4-inch glass sliding doors; double track rolling door assembly.
 - 2. Framed 13/16-inch thick stile and rail sliding doors; top mounted track with dual roller hangers. Vertical adjustment for accurate alignment.
- E. Drawer Slides:
 - 1. Standard drawers: 3/4 extension, self-closing, white epoxy-coated, lever disconnect, positive in-stop/out-stop, nylon rollers, minimum 100-pound dynamic load rating at full extension.
 - 2. File drawers: Full extension, three-part progressive opening slide, precision steel ball bearing, minimum 100-pound dynamic load rating at full extension, zinc plated or epoxy coated at manufacturer's option.
 - 3. Provide body mounted molded rails for hanging file system for legal or letter size as indicated by manufacturer's model number. Cutting or machining of drawer body/face not permitted.
 - 4. Paper storage drawers: Full extension, self-closing, white epoxy-coated, lever disconnect, positive in-stop/out-stop, nylon rollers, minimum 150-pound dynamic load rating at full extension.
- F. Catches:
 - 1. Provide opening resistance in compliance with the Americans with Disabilities Act:
 - a. Provide top-mounted magnetic catch for base and wall cabinet door.
 - b. Provide two (2) at each tall cabinet door. Catch housing shall be molded in White.
- G. Adjustable Shelf Supports:
 - 1. Dual-pin design with anti-tip-up shelf restraints for both 3/4-inch and one-inch (1") shelves.
 - 2. Include keel to retard shelf slide-off, and slot for mechanical attachment of shelf to clip.
 - 3. Load rating shall be minimum 300 pounds each support without failure.
- H. Wardrobe Rod: 1-1/6-inch diameter plated steel rod, with captive sockets.
- I. Coat Hooks: Single and double prong, wall mount - satin aluminum.

- J. Locks: Five-disk tumbler cam-style with strike. Locks on cabinets in same room keyed alike. Provide two (2) keys per room where doors and drawers are scheduled to receive locks. Dull chrome finish. Lock core shall be removable with a control key, permitting Owner to change lock arrangements without tools.

2.4 SPECIALTY ITEMS

- A. Grommets:
 - 1. Approved Product/Manufacturer: Model No. EDP3 manufactured by Doug Mockett & Company, Inc. (basis of design), Manhattan Beach, CA; (800) 523-1269, or Architect approved equal.
 - 2. Size: 2-1/2 inches diameter with "Flip-Top"™ tab in cap.
 - 3. Colors: As selected by Architect from manufacturer's available colors.
 - 4. Number/location: Where electrical, telephone, and computer data wiring need to pass through tops whether shown or not.

2.5 SOLID STOCK

- A. Moisture Content: Percent of moisture in relation to over-dry weight shall be between eight percent (8%) and 13 percent at time of installation.
- B. Natural Finish Hardwood:
 - 1. Occasional knot permitted provided it is tight and smooth.
 - 2. Grain pattern: Rift-cut.
 - 3. Species: WI "Premium" Grade, white oak.
- C. Paint Grade Hardwood: Any species, including Parana Pine, except do not use oak, elm, or similar species that have coarse grain.

2.6 MISCELLANEOUS

- A. Utility Shelving: WI "Economy" grade.
- B. Telephone/MDF/IDF Board: Provide minimum four foot by eight foot by 3/4-inch (4' x 8' x 3/4") thick plywood for telephone/data punch down blocks and video equipment in accordance with Section 06 10 00: Rough Carpentry. Paint in accordance with Section 09 90 00: Painting and Coating.

2.7 MILLWORK FABRICATION

- A. Use the WI Custom Grade woodwork classification unless noted elsewhere complying with referenced quality standard.
- B. Fabricate casework, countertops, and related products to dimensions, profiles, and details shown on Drawings. Fabricate casework square, plumb, and true.
- C. Detailed Requirements for Cabinet Construction:
 - 1. Toe-base:
 - a. Continuous, ladder type platform with concealed fastening to cabinet bottom, level and secured to floor.
 - b. Toe-base at exposed cabinet end panels shall be recessed 1/4-inch from face of finished end for flush installation of finished base material.
 - c. No cabinet sides-to-floor will be allowed.
 - 2. Cabinet top and bottom:

- a. Solid sub-top shall be furnished for all base and tall cabinets.
 - b. At cabinets over 36-inches, bottoms and tops shall be mechanically joined by a fixed divider.
 - c. Assembly devices shall be concealed on bottom side of wall cabinets.
 - 3. Cabinet sides:
 - a. Doweled, and glued under pressure, or attached with fully concealed interlocking mechanical fasteners to sub-top and bottom.
 - b. Drill holes for adjustable shelves 1-1/4 inch on center.
 - 4. Cabinet backs:
 - a. Side bound, captured in grooves, recessed from cabinet rear, and securely fastened at top and bottom.
 - b. Hang rails shall be located at rear of cabinet back and fastened to cabinet sides. Provide minimum of two (2) at base, two (2) at wall, and three (3) at tall cabinets as instructed by casework manufacturer.
 - c. Provide removable back panels and closure panels for plumbing access at all sink cabinets, and where shown on Drawings.
 - 5. Exposed end corner and face frame attachment:
 - a. Butt joint, glued and finish nailed; or attached with fully concealed interlocked mechanical fasteners.
 - 6. Door and drawer fronts:
 - a. Drawer fronts and hinged doors shall overlay the cabinet body. Maintain a maximum 1/8-inch reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within the cabinet.
 - b. Where indicated, provide stile and rail doors with full 1/4-inch plate glass, hinged or sliding. Exposed lite-opening edges shall be trimmed and glazed with extruded glazing bead.
 - c. Where indicated, frameless sliding glass doors shall be 1/4-inch thick plate glass with ground and polished edges. Fit with anodized aluminum shoes and nylon rollers.
- D. Drawers:
- 1. Drawer fronts: Apply to separate drawer body component sub-front.
 - 2. Drawer sides: Doweled to receive front and back, glued under pressure, machine squared.
 - 3. Drawer bottom: Set into front and sides, 1/4-inch deep groove with minimum 3/8-inch standing shoulder, continuously glued. Reinforce drawer bottoms with 1/2-inch by four-inch (4") front-to-back intermediate underbody stiffeners, mechanically fastened. One (1) at 24 inches, two (2) at 36 inches, and over.
 - 4. Paper storage drawers: Fitted with full width hood at back.
 - 5. Hanging file drawers shall be fabricated to accept letter size hanging folders compatible with Pendaflex system.
- E. Vertical and Horizontal Dividers: As required by manufacturer for type and style of component.
- F. Door/Drawer Front Rail: As required by manufacturer for type and style of component, and hardware placement.
- G. Accessibility Requirements - 2022 California Building Code, Section 11B:
- 1. The following special requirements shall be met, where specifically indicated on architectural Plans as "accessible" or by general note. Shall be in compliance with California title 24 access:
 - a. Countertop height: With or without cabinet below, not to exceed a height of 34 inches above finished floor (A.F.F.), at a surface depth of 24 inches.
 - b. Knee space clearance: Minimum 27 inches A.F.F. at apron, and 30 inches clear

span width (11B-306.3).

- c. Sink cabinet clearances: In addition to above, upper knee space frontal depth shall be no less than eight inches (8"), and lower toe frontal depth shall be no less than 11 inches, at a point nine inches (9") A.F.F., and as further described in 11B-306.

H. Typical Desk or Counter Height at Knee Space Locations: 30 inches A.F.F.

PART 3 EXECUTION

3.1 JOB CONDITIONS

- A. Environmental Requirements:
 - 1. Do not install casework until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least one (1) week:
 - a. Manufacturer/supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.
 - b. After installation, control temperature and humidity to maintain relative humidity between 25 and 55 percent.
- B. Conditions: Do not store or install casework in building until concrete, masonry, and drywall/plaster work is dry.

3.2 COORDINATION

- A. Coordinate the work of this Section with plumbing work specified in Division 22. Coordinate sink opening construction with sinks specified in Division 22 or as indicated on Drawings.
- B. Coordinate location of blocking in walls for installation and support of wall cabinets.

3.3 MILLWORK INSTALLATION

- A. Positioning: Place approximately level, plumb, and at right angles to adjacent work.
- B. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging the products and adjacent work.
- C. Anchorage: Attach securely so the products will perform to their maximum ability without damage from inadequate fastenings.
- D. Fasten tops to frames with concealed clips, screws, and glue.
- E. Install simulated wood trim in locations shown on Drawings and in accordance with manufacturer's instructions.

3.4 FINISH HARDWARE INSTALLATION

- A. The supplier will mark each item of hardware for location. Protect the markings until each item is installed. If any item is delivered to the job not properly marked, return it to the supplier for marking before attempting to install it.
- B. Check markings on hardware for proper location. Install and make necessary adjustments for proper working order. Any hardware damaged by improper adjustment or careless abuse will be replaced by Contractor at his expense.

- C. Provide clean, properly sized, and accurately placed mortises and drilled holes for all mortise hardware such as locksets and for cylindrical locks where specified only.
- D. Fit all surface-applied hardware accurately.
- E. After hardware is installed, protect exposed surfaces by use of heavy paper and masking tape and maintain until job completion.
- F. Remove all finish hardware except that which is primed for painting before painter's finish is applied. Permanently replace and re-adjust for proper function after painter's finish has dried hard.
- G. Millwork contractor shall be responsible for hardware on millwork.

3.5 PLASTIC LAMINATE FACED WOOD DOOR INSTALLATION

- A. Protect all doors during handling.
- B. Install doors in accordance with manufacturer's instructions.
- C. Install and adjust doors for smooth, quiet operation.
- D. Refer to Section 08 71 00 Door Hardware where applicable.

END OF SECTION 06 20 00

SECTION 06 73 00 COMPOSITE DECKING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Deck.
 - 2. Accessibility ramp and railing.
 - 3. Bench.
 - 4. Framing and supports.
 - 5. Accessories necessary for a complete installation.
- B. Related Sections:
 - 1. Section 05 50 00: Metal Fabrications.

1.3 SUBMITTALS

- A. Product Data: Technical data and installation recommendations for plastic decking and metal framing anchors.
- B. Samples: Submit samples not less than 24 inches long showing the range of variation anticipated in appearance of decking, including surface texture.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Building code: Comply with applicable provision of the 2022 California Building Code (CBC) with local amendments for exterior plastic materials and components and structural loading for decks.
 - 2. Surface burning characteristics:
 - a. Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency:
 - 1) Flame spread index: 25 or less.
 - 2) Smoke developed index: 450 or less.
- B. Plastic Lumber: Products complying with applicable Code provisions for indicated type of construction. Allowable loads and spans as documented in evaluation reports or in information referenced in evaluation reports shall not be less than design loads and spans indicated.

1.5 WARRANTY

- A. Commercial Warranty:
 - 1. Written warranty signed by manufacturer warranting against rot, decay, splitting, checking, splintering, fungal damage, and termite damage:
 - a. Materials and installation warranty period: Ten (10) years from the date of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
- B. Handle and store plastic lumber to comply with manufacturer's written instructions.

PART 2 PRODUCTS

2.1 PLASTIC DECK

- A. Basis of Design: Plastic Lumberyard, Structural 2x12.
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. Plastic Lumberyard
 - b. Or Equal.
- B. Composite Plastic Lumber:
 - 1. Solid shapes made from a mixture of recycled plastic and fiberglass reinforcement:
 - a. Deck board size: 2 inch by 12 inches nominal (1 1/2 in by 11 1/4 in actual).
 - b. Surface texture: Smooth.
 - c. Color: Selected by Architect from standard colors.
- C. Fasteners:
 - 1. Fasteners of size and type indicated, acceptable to AHJ, comply with requirements. Provide stainless steel nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches (38 mm) into substrate:
 - a. Stainless steel bolts: ASTM F593, Alloy Group 1 or 2 with ASTM F594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the work. Proceed with installation after correcting unsatisfactory conditions.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.
- C. Install plastic lumber to comply with manufacturer's written instructions. Secure decking to framing with deck clips or screws:
 - 1. Install metal framing anchors to comply with manufacturer's written instructions.
 - 2. Do not splice structural members between supports unless otherwise indicated.

3. Provide blocking and framing as necessary to support facing materials, fixtures, specialty items, and trim.
- D. Securely attach deck framing to substrate by anchoring and fastening using fasteners recommended by manufacturer. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced and with adjacent rows staggered.

END OF SECTION 06 73 00

SECTION 06 83 16 FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Glass fiber reinforced plastic paneling.
 - 2. Trim accessories.
 - 3. Accessories necessary for a complete installation.
- B. Related Sections:
 - 1. Section 07 92 00: Joint Sealants.

1.3 SUBMITTALS

- A. Product Data: Technical data including supporting documentation of compliance with surface burning characteristics for FRP and accessories.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Building code: Comply with applicable requirements of the 2022 California Building Code (CBC) for interior plastic materials and interior wall finishes.
 - 2. Surface burning characteristics:
 - a. Determined by testing identical products according to ASTM E84 by qualified testing agency. Identify products with appropriate markings of applicable testing agency:
 - 1) Flame spread index: 25 or less.
 - 2) Smoke developed index: 450 or less.
- B. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Glass Fiber Reinforced Plastic Paneling:
 - 1. Gelcoat finished, glass fiber reinforced plastic panels complying with ASTM D5319:
 - a. Provide USDA accepted panels for incidental food contact.
 - b. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1) Marlite (basis of design), 1 Marlite Dr, Dover, OH 4462. Ph: 800-377-1221. www.marlite.com
 - 2) Crane Composites, Inc.
 - 3) Glasteel.
 - 4) Nudo Products, Inc.

- 5) Parkland Plastics, Inc.
- c. Nominal thickness: Not less than 0.09 inch (2.3 mm).
- d. Surface finish: Smooth (no texture).
- e. Color: Selected by Architect.

2.2 ACCESSORIES

- A. Trim Accessories:
 - 1. One-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges:
 - a. Color: Selected by Architect.
- B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.
- C. Concealed Mounting Splines: Continuous, where applicable, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory laminated panels and to be fastened to substrate.
- D. Adhesive: Recommended by plastic paneling manufacturer.
- E. Sealant: Mildew resistant, single component, neutral curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 07 92 00: Joint Sealants.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

3.2 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the work.
- B. Proceed with installation after correcting unsatisfactory conditions.

3.3 PREPARATION

- A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.
- B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.
- C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.
- D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

- E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels so that trimmed panels at corners are not less than 12 inches (300 mm) wide:
 - 1. Mark plumb lines on substrate at trim accessory panel joint locations for accurate installation.
 - 2. Locate trim accessories panel joints to allow clearance at panel edges according to manufacturer's written instructions.

3.4 INSTALLATION

- A. Install plastic paneling according to manufacturer's written instructions.
- B. Install panels in a full spread of adhesive.
- C. Install panels with fasteners. Layout fastener locations and mark on face of panels so that fasteners are accurately aligned:
 - 1. Drill oversized fastener holes in panels and center fasteners in holes.
 - 2. Apply sealant to fastener holes before installing fasteners.
- D. Install factory laminated panels using concealed mounting splines in panel joints.
- E. Install trim accessories with adhesive and nails; no staples. Do not fasten through panels.
- F. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.
- G. Maintain uniform space between panels and wall fixtures. Fill space with sealant.
- H. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.
- I. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 06 83 16

SECTION 07 19 00 WATER REPELLENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Penetrating water repellent treatment for masonry and concrete surfaces.
 - 2. Film forming water repellent treatments for masonry and concrete surfaces.
 - 3. Accessories necessary for a complete installation.

1.3 SUBMITTALS

- A. Product Data: Technical data including performance data, DFT per coat, spreading rate, number of coats for each type of substrate, application procedures, and available colors.

1.4 PERFORMANCE REQUIREMENTS

- A. Performance: Water repellents shall meet the following performance requirements as determined by testing on standard substrates representing those indicated.
- B. Water Absorption:
 - 1. Minimum 90 percent reduction of water absorption after 24 hours for treated compared to untreated specimens when tested according to the following:
 - a. Cast stone: ASTM C1195.
 - b. Concrete masonry units: ASTM C140.
 - c. Clay brick: ASTM C67.
 - d. Portland cement plaster (stucco): ASTM D6532.
- C. Water-Vapor Transmission:
 - 1. Comply with one or both of the following:
 - a. Maximum ten percent (10%) reduction water-vapor transmission of treated compared to untreated specimens, according to ASTM E96/E96M.
 - b. Minimum 80 percent water-vapor transmission of treated compared to untreated specimens, according to ASTM D1653.
- D. Water Penetration and Leakage through Masonry: Minimum 90 percent reduction in leakage rate of treated compared to untreated specimens, according to ASTM E514/E514M.
- E. Durability: Maximum five percent (5%) loss of water repellent performance after 2,500 hours of weathering according to ASTM G154 compared to water repellent-treated specimens before weathering.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.
- B. Pre-Installation Conference: Conduct conference at site.

1.6 WARRANTY

- A. Written warranty signed by manufacturer in which manufacturer and applicator agree to repair or replace materials that fail to maintain water repellency within specified warranty period:
 - 1. Warranty period: Two (2) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PENETRATING WATER REPELLENTS

- A. Silane, penetrating water repellent:
 - 1. Clear, containing 20 percent or more solids of alkyltrialkoxysilanes; with alcohol, mineral spirits, water, or other proprietary solvent carrier; and with 400 g/L or less of VOCs:
 - a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1) W.R. Meadows; (800) 342-5976.
 - 2) BASF Corporation; Construction Systems; (800) 526-1072.
 - 3) PROSOCO, Inc.; (800) 255-4255.
 - 4) Tnemec, Inc.; (816) 483-3400.
 - 5) Vexcon Chemicals Inc.; (888) 839-2661.
 - 6) Approved equal.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Limitations:
 - 1. Proceed with application when existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
 - a. Concrete surfaces and mortar have cured for not less than 28 days.
 - b. Building has been closed in for not less than 30 days before treating wall assemblies.
 - c. Ambient temperature is above 40 degrees F (4.4 degrees C) and below 100 degrees F (37.8 degrees C) and will remain so for 24 hours.
 - d. Substrate is not frozen and substrate surface temperature is above 40 degrees F (4.4 degrees C) and below 100 degrees F (37.8 degrees C).
 - e. Rain or snow is not predicted within 24 hours.
 - f. Not less than 24 hours have passed since surfaces were last wet.
 - g. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

3.2 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements and conditions affecting performance of the Work:
 - a. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in minimum of three (3) representative locations by method recommended by manufacturer.
 - b. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
 - c. Verify that required repairs are complete, cured, and dry before applying water

repellent.

- B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica containing or siliceous minerals.
- C. Proceed with installation after correcting unsatisfactory conditions.

3.3 PREPARATION

- A. New Construction and Repairs: Allow concrete and other cementitious materials to age before application of water repellent, according to repellent manufacturer's written instructions.
- B. Cleaning:
 - 1. Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water repellent manufacturer's written instructions:
 - a. Cast stone and concrete unit masonry: Remove oil, curing compounds, laitance, and other substances that inhibit penetration or performance of water repellents according to ASTM E1857.
 - b. Clay brick masonry: ASTM D5703.
 - c. Natural stone: ASTM C1515.
 - d. Portland cement plaster (stucco): ASTM E1857.
- C. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.
- D. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.
- E. Coordination with Sealant Joints:
 - 1. Do not apply water repellent until sealants for joints adjacent to surfaces receiving water repellent treatment have been installed and cured:
 - a. Water repellent work may precede sealant application if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

3.4 APPLICATION

- A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect the substrate before application of water repellent and to instruct applicator on the product and application method to be used.
- B. Apply coating of water repellent on surfaces to be treated using 15 psi (103 kPa) pressure spray with a fan type spray nozzle, roller, or brush to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated:
 - 1. Precast concrete and cast stone: At Contractor's option, first application of water repellent may be completed before installing units. Mask mortar and sealant bond surfaces to prevent water repellent from migrating onto joint surfaces. Remove masking after repellent has cured.

- C. Apply second saturation coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.5 FIELD QUALITY CONTROL

- A. Testing of Water Repellent Material:
 - 1. Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when water repellent is being applied:
 - a. Owner will engage the services of a qualified testing agency to sample water repellent material being used. Samples of material delivered to site will be taken, identified, sealed, and certified in presence of Contractor.
 - b. Testing agency will perform tests for compliance of water-repellent material with product requirements.
 - c. Owner may direct Contractor to stop applying water repellents if test results show material being used does not comply with product requirements. Contractor shall remove noncomplying material from Project site, pay for testing, and correct deficiency of surfaces treated with rejected materials, as approved by Architect.
- B. Coverage Test:
 - 1. In the presence of Architect, hose down a dry, repellent-treated surface to verify complete and uniform product application. A change in surface color will indicate incomplete application:
 - a. Notify Architect seven (7) days in advance of the dates and times when surfaces will be tested.
 - b. Reapply water repellent until coverage test indicates complete coverage.

3.6 CLEANING

- A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.
- B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07 19 00

SECTION 07 41 13 METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Prefinished, prefabricated corrugated lapping roof panels.
- B. Related Requirements:
 - 1. Section 05 10 00: Structural Metal Framing.
 - 2. Section 05 50 00: Metal Fabrications.
 - 3. Section 07 62 00: Sheet Metal Flashing and Trim
 - 4. Section 07 92 00: Joint Sealants.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASCE 7: Minimum Design Loads for Buildings and Other Structures.
 - 2. ASTM A653: Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
 - 3. ASTM A792: Steel Sheet, 55 % Aluminum Zinc Alloy Coated by the Hot Dip Process.
 - 4. ASTM C1371: Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
 - 5. ASTM E1680: Rate of Air Leakage Through Exterior Metal Roof Panel Systems
 - 6. ASTM E1592: Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
 - 7. ASTM E1646: Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
 - 8. ASTM E1918: Measuring Solar Reflectance of Horizontal and Low Sloped Surfaces in the Field.
 - 9. FM Approvals Standard 4471: Class 1 Panel Roofs.
 - 10. SMACNA Architectural Sheet Metal Manual.
 - 11. UL 580: Standard for Tests for Uplift Resistance of Roof Assemblies
 - 12. UL 2218: Impact Resistance: Class 4
 - 13. UL 790: Fire Resistance Rating – Class A

1.3 SUBMITTALS

- A. Product Data.
- B. Shop Drawings:
 - 1. Indicate thickness and dimensions of parts, fastenings and anchoring methods, details and locations of joints, transitions and other provisions necessary for thermal expansion and contraction.
 - 2. Indicate locations of field- and factory-applied sealant.
- C. Samples:
 - 1. Submit two samples, 12 inches long by 12 inches wide.
 - 2. Submit standard color samples of metal for Architect's selection.
- D. Manufacturer Qualifications.

- E. Installer Qualifications: Submit list of completed projects, with names and contact information for architects and contractors.
- F. Test Reports: Indicating compliance of products with project requirements.
- G. Warranty Documentation.
- H. Insurance Documentation.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Ten years' experience, minimum, in factory fabrication of metal panels.
 - 2. Manufacturer shall carry \$2,000,000 liability insurance, minimum, for metal panel system.
- B. Installer Qualifications:
 - 1. Three years' experience, minimum, in application of metal roof or wall panels.
 - 2. Five satisfactory projects with metal panel work of similar scope and complexity to Work of this Project.
- C. Testing Agency Qualifications: Agency compliant with ISO/IEC Standard 17025, or an accredited independent agency recognized by the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement or ANSI.
- D. Mock-Ups:
 - 1. Visual Mock-Up: Construct mock-up, 10 by 10 feet or larger as required to show at least two pattern repeats.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements:
 - 1. Keep panels and accessory items dry.
 - 2. Protect against damage and discoloration.
 - 3. Handle panels with non-marring slings.
 - 4. Support panels to prevent permanent deformation.
 - 5. Store panels above ground, with one end elevated for drainage.
 - 6. Protect panels against standing water and condensation between adjacent surfaces.
 - 7. If panels become wet, immediately separate sheets, wipe dry with clean cloth, and keep sheets separate for air-drying.
 - 8. Painted panels shall be shipped with protective plastic sheeting or a strippable film coating between panels. Remove strippable film coating prior to installation. Do not allow strippable film coating to remain on panels in extreme heat, cold, or direct sunlight or other UV source.
 - 9. Do not allow panels to contact treated lumber.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard 25-year performance warranty, stating the following:
 - 1. Architectural fluorocarbon finish:
 - a. Will be free of fading or color change in excess of 5 Hunter delta-E units as determined by ASTM D2244-02.
 - b. Will not chalk in excess of numerical rating of 8 when measured in accordance with standard procedures specified in ASTM D4214-98 method D659.

- c. Will not peel, crack, chip, or delaminate.
- 2. Metal substrate will not rupture, fail structurally, or perforate.
- B. Installer's Warranty: Warrant panels, flashings, sealants, fasteners and accessories against defective materials and/or workmanship, covering repairs required to maintain roof panels watertight and weatherproof with normal usage for two years following Project Substantial Completion date.
 - 1. Furnish written warranty, signed by installer.
- C. Weathertight Performance Warranty: Manufacturer's standard warranty in which manufacturer agrees to repair or replace metal roof panel assemblies that fail to remain weather tight within specified warranty period.
 - 1. Contact AEP Span for Weathertight Warranty information and requirements.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Products: Provide the following:
 - 1. Metal Sales; 7/8" corrugated roof panel
- B. Substitution Limitations: Substitutions will be considered in accordance with Section 01 25 00 "Substitution Procedures".
- C. Performance Criteria
 - 1. Wind Uplift: Class 90 per UL 580.
 - a. Panel system shall be ASTM E1592 tested under the supervision of an ANSI or ISO/IEC accredited laboratory and the laboratory shall issue the test report.
 - b. Deflection Limits: Withstand wind loads with deflections no greater than 1/180 of the span.
 - 2. FM Rating: Class 1-90 according to FM Approvals Standard 4471.
 - 3. Air Infiltration: Tested in accordance with ASTM E1680.
 - a. 0.022 cfm per linear foot of joint at static test pressure differential of 12.00 psf.
 - 4. Water Penetration: No leakage through panel side seams and endlaps after six hours when tested according to ASTM E2140 at a static water pressure head of 6.00 inches.
 - 5. Thermal Movements: Accommodate thermal movement without buckling, joint opening, overstressing components, failure of connections, or other detrimental effects, through the following temperature changes:
 - a. 120 degrees F, ambient.
 - b. 180 degrees F, material surface.

2.2 PANELS

- A. Panels: Metal Sales; 7/8" corrugated roof panels
 - 1. Material: steel conforming to ASTM A792
 - a. 20 gauge: Yield strength 50,000 psi; with aluminum zinc alloy coating conforming to ASTM A792, Class AZ50
 - b. Thickness and yield strength as required for performance indicated; with aluminum-zinc alloy coating conforming to ASTM A792, Class AZ50.
 - 2. Panel width and pattern:
 - a. 32" wide, 7/8" corrugation

- b. Panel lap: 3"
- 3. Panel Finish: MS Colorfast45 silicone-modified polyester
 - a. Panel color: as selected from manufacturer's range of standard colors
- 4. Seam Sealant: double bead tape sealant per manufacturer's recommendations.

2.3 FRAMING AND SUBSTRATES

- A. Secondary Framing: See Section 05 40 00 "Cold-Formed Metal Framing".
- B. Roofing Underlayment:
 - 1. Structural steel framing members

2.4 ACCESSORIES

- A. Trims and Flashings: Material, metal thickness, and finish to match panels. Profiles indicated in Drawings.
 - 1. Provide manufacturer's standard accessories and other items essential to completeness of standing seam roof installation.
- B. Panel Penetration Flashings: As recommended by panel manufacturer; designed to provide sufficient movement to prevent creation of points of fixity at penetrations.
- C. Sealant for Field Application: high grade non-curing butyl or curing urethane sealant as recommended by panel manufacturer. Do not use sealant containing asphalt.

2.5 FABRICATION

- A. Fabrication, General:
 - 1. Unless otherwise shown on Drawings or specified herein, fabricate panels in continuous lengths and fabricate flashings and accessories in longest practical lengths.
 - 2. Panels shall be factory correctively-leveled.
- B. Panels:
 - 1. Provide panels in full length from ridge to eave when possible.
 - 2. Where single length panels are not practical, provide mated swaged panels for positive joint end laps, shingled to accommodate water run-off (fabricated with overlap in direction of water flow).
 - 3. Roof panels shall have flush horizontal and vertical surfaces to facilitate sealing at terminations. Panel configurations which create voids and requiring supplemental closure devices shall not be considered acceptable.
 - 4. Engineer panels to use concealed anchors that permit expansion and contraction, except at eaves, end laps, ridges, valleys, hips and gables.
- C. Seams:
 - 1. Panel seams shall lap entire length of seam.
 - 2. Provide pre-installed sealant within confines of panel's female leg to aid in resistance of leaks and provide panel-to-panel seal while allowing expansion and contraction movement.
 - 3. Seams shall be continuously lapped together by mechanical means during installation.
- D. Fabrication Tolerances:
 - 1. Flat metal surfaces will display waviness commonly referred to as "oil canning". This is caused by steel mill tolerances and is a characteristic, not a defect, of panels manufactured from light

gauge metal. Panels are factory correctively-leveled to minimize the occurrence of "oil canning". As such, "oil canning" will not be accepted as cause for rejection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: With Installer present.
 - 1. Examine conditions and substrates on which metal panels are to be installed. Structural support or substrate shall be flat and plumb to avoid panel stresses and distortion.
 - 2. Prior to starting work, correct defects.
- B. Field Measurements:
 - 1. Coordinate field measurements and fabrication schedule with construction progress.
 - 2. Field measure prior to fabrication. Show recorded dimensions on shop drawings, including locations of shop-fabricated openings.
 - 3. If field measurements differ from drawing dimensions, notify Architect prior to fabrication.
- C. Structural Steel Tolerances: Deviations from flat plane shall not exceed the following.
 - 1. 1/4 inch in 20 feet.
 - 2. 1/2 inch across building elevation.
 - 3. 1/8 inch in 5 feet.

3.2 PREPARATION

- A. Install according to approved shop drawings and metal panel manufacturer's recommendations.

3.3 INSTALLATION

- A. Panels and Trim: Comply with manufacturer's instructions for assembly, installation and erection for weather tight installation.
 - 1. Install according to approved shop drawings.
 - 2. Install panels in accordance with manufacturer's instructions and recommendations. Anchor securely in place using clips and fasteners spaced in accordance with manufacturer's recommendations for design wind load criteria.
 - 3. Comply with methods and recommendations of SMACNA Architectural Sheet Metal Manual for flashing configurations required.
 - 4. Discrepancies between job site conditions and shop drawings shall be brought to the attention of the Architect for resolution.
 - 5. Cutting and Fitting:
 - a. Cut panels neat, square, and true with shearing action cutters. Torch or power saw cutting is prohibited.
 - b. Openings 6 inches and larger: Shop fabricate and reinforce to maintain original load capacity.
 - c. Openings less than 6 inches: Field cutting is acceptable.
 - 6. Dissimilar Metals or Materials:
 - a. Where panel or trim may come in contact with dissimilar metals or treated lumber, fabricate transition to facilitate drainage and minimize possibility of galvanic action. Galvanic action can cause panels and trim to fail prematurely.
 - b. At points of contact with dissimilar metal or treated lumber, coat panel and trim with protective paint or separate materials with a weatherproof underlayment.

- c. Direct contact or run-off from CCA, ACQ, CA, or other treated lumber (outdoor wood) or fire retardant impregnated or treated wood shakes or siding can cause panels and trim to fail prematurely. Avoid contact with these materials.
- B. Accessories: Install trims, flashings, and roofing specialties according to Drawings and manufacturer's recommended details.
- C. Sealant Installation: Apply according to approved shop drawings and SMACNA Architectural Sheet Metal Manual recommendations.
 - 1. Provide airtight and waterproof installation.

3.4 CLEANING

- A. Repairs:
 - 1. Touch up paint is not required for panels with scratches that do not expose metal.
 - 2. Panels or flashings with finish damage exposing metal or with substrate damage shall be replaced.
- B. Cleaning and Waste Management:
 - 1. At completion of each day's work and at work completion, sweep panels, flashings, and gutters clean. Do not allow fasteners, cuttings, filings, or scraps to accumulate.
 - 2. Clean exposed surfaces of work promptly after completion of installation.

3.5 PROTECTION

- A. Protect Work as required to ensure that roofing will be without damage at Final Completion.

END OF SECTION 07 41 13

SECTION 07 62 00 SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. It is the intent of this Section that the work shall:
 - 1. Conform to all applicable DSA and building code requirements.
 - 2. Include all shop and field formed sheet metal work shown on Drawings, specified, or required, including, but not limited to:
 - a. Roof penetration sleeves, collars, hood, and umbrella counterflashing.
 - b. Metal counterflashing.
 - c. Expansion joint.
 - d. Metal perimeter edge.
 - e. Gutters, downspouts, splash blocks and splash pans.
 - f. One-way roof moisture relief vents.
 - g. Metal gravity vents.
 - h. Metal heat exhaust vents.
 - i. Sanitary vent pipes.
 - j. Pipe box.
 - k. Copings, trim, and miscellaneous sheet metal accessories.
- B. Related Sections:
 - 1. Section 05 50 00: Metal Fabrications.
 - 2. Section 07 72 00: Roof Accessories.
 - 3. Section 07 92 00: Joint Sealants.
 - 4. Division 22: Plumbing.
 - 5. Division 23: Heating, Ventilating & Air Conditioning (HVAC).
- C. Reference Standards:
 - 1. ASTM International (ASTM):
 - a. A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - b. B32 Standard Specification for Solder Metal.
 - c. C1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
 - 2. National Association of Architectural Metal Manufacturers (NAAMM).
 - 3. National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual.
 - 4. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) Architectural Sheet Metal Manual.
 - 5. ANSI SPR1ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

1.3 SUBMITTALS

- A. Product Data:

1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 2. Manufacturer's installation instructions.
- B. Shop Drawings: Indicating sizes, configurations, and details of attachment to related and adjacent work, materials, and finishes. Shop drawings required for each flashing detail.
- C. Samples:
1. Full range of finish colors for Architect's selection.
 2. 12-inch long sample of each specified item with approved finish.
 3. Provide full size mockup of all shop built assemblies.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Fabricator and installer of roof related flashing and accessories shall be the same as the membrane roof installer.
- B. Comply with governing codes and regulations of authorities having jurisdiction.
- C. Installation Conference:
1. Refer to Section 01 31 00: Project Management and Coordination.

1.5 WARRANTY

- A. Manufacturer's Product Warranty:
1. Manufacturer's standard 20-year Kynar 500 or Hylar 5000 finish warranty signed by the manufacturer, with guarantee covering any failure of the fluoropolymer finish during the warranty period.
 2. Failure is defined to include, but is not limited to, deterioration of finish, such as fading, discoloring, peeling, cracking, corroding, etc.
 3. Correction may include repair or replacement of failed product.
- B. Roofing Contractor's Warranty:
1. Contractor shall warrant the sheet metal work and related work to be free from defects in workmanship and materials, and that the metal flashings will be and remain watertight, for a period of five (5) years from date of Substantial Completion.
 2. Defects shall include, but not be limited to:
 - a. Leaking water or bitumen within building or construction.
 - b. Becoming loose from substrate.
 - c. Loose or missing parts.
 - d. Finish failure as defined above.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Handle and store materials and equipment in such a manner as to avoid damage.
- C. No storage of materials shall be permitted on roof areas other than those materials that are to be installed the same day. Any exception must be in written form. Do not place materials or equipment in such a manner as to overload structure.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Manufacturers named within specification are approved for use on the Project providing:
 - 1. Their products meet or exceed the specifications.
 - 2. Company has a minimum of five (5) years' experience manufacturing products of the type specified.
 - 3. Products have been tested in conjunction with roofing membrane system as an assembly and as such has obtained the same approval and rating as the roofing membrane system.
 - 4. Products are approved for use by the roofing membrane manufacturer.
- B. Substitutions shall be in accordance with Division 01 requirements regarding substitutions.

2.2 SHEET METAL MATERIALS

- A. Material
 - 1. Hot-dipped galvanized steel at steel components.
 - 2. Aluminum at aluminum components such as storefront.
 - 3. Stainless steel where dissimilar metals meet or in marine environments.
 - 4. Galvanized steel minimum 22 gauge. Comparable thicknesses for other metals.
 - 5. Penetration may be lead flashing
- B. 18 gauge gutters with a minimum four inch profile with a 1-inch reveal at lip, 8-inch flange under roofing, 16 gauge bracket supports and strainers at downspouts.
 - 1. Downspouts to be galvanized schedule 40 steel-pipe, painted. (see 05 50 00)
 - 2. Gutters to have Kynar finish.
- C. Attic vents, 20 gauge stainless steel.
- D. Reglets, steel or aluminum as manufactured by Fry <http://fryreglet.com>, plastic not allowed.
- E. Use appropriate pipe penetration flashing depending on roofing type.

2.3 FASTENERS

- A. Same metal as flashing/sheet metal or other noncorrosive metal or as noted below.
- B. Exposed fasteners shall be self-sealing and gasketed for weathertight installation (ZAC type).
- C. Match finish of exposed heads with material being fastened.
- D. Mechanical Fasteners:
 - 1. Nails: Stainless steel ring shank, minimum 1-1/2 inch in length with 1/2-inch diameter head.
 - 2. Washers: Steel washers with bonded rubber sealing gasket.
 - 3. Screws: Self-tapping sheet metal type of stainless steel or compatible with material being fastened, with hooded integral EPDM washers (ZAC type).
 - 4. Rivets: Stainless steel and cadmium plated material, closed end type of sizes recommended by sheet metal manufacturer to suit application.

- E. Clips: Continuous cleat (coping/fascia). Minimum 20-gauge, G-90 galvanized, stainless steel, or aluminum. Match material of coping/fascia and provide one (1) gauge heavier.

2.4 RELATED MATERIALS

- A. Solder: ASTM B32, alloy grade 58, 50 percent tin, 50 percent lead.
- B. Flux:
 - 1. Phosphoric acid type, manufacturer's standard:
 - a. For use with steel or copper: Rosin flux.
 - b. For use with stainless steel: Acid-chloride type flux, except use rosin flux over tinned surfaces.
- C. Underlayment:
 - 1. 48 mil minimum, non-reinforced, homogeneous, waterproof, impermeable elastomeric sheeting manufactured by Nervastral, Inc. or Lexus Co.
- D. Adhesives: Type recommended by flashing sheet manufacturer seaming and adhesive application of flashing sheet to ensure adhesion and watertightness.
- E. Metal Accessories: Sheet metal clips, straps, anchoring devices, clamps, and similar accessories required for the complete installation of work, matching or compatible with material being installed, non-corrosive, and size and gauge recommended by installer to suit application and performance.
- F. Sealant:
 - 1. Type A:
 - a. Type: One-part, non-sag, moisture-curing polyurethane sealant.
 - b. Approved products/manufacturers:
 - 1) Chem-Calk 900, manufactured by Bostik Construction Products Division.
 - 2) Vulkem 921, manufactured by Mameco International, Inc.
 - 3) Dynatrol I, manufactured by Pecora Corporation.
 - 4) NP 1, manufactured by Sonneborn Building Products.
 - 5) Approved equal.
 - 2. Type B:
 - a. Type: One-part, neutral-curing, medium-modulus silicone sealant for sealing metal to metal surfaces, i.e. metal edge, cover plates, etc.
 - b. Approved products/manufacturers:
 - 1) Chem-Calk 1200, manufactured by Bostik Construction Products Division.
 - 2) 795 Silicone Building Sealant, manufactured by Dow Corning Corporation.
 - 3) 895 Silicone, manufactured by Pecora Corporation.
 - 4) Omniseal, manufactured by Sonneborn Building Products
 - 5) Spectrem 2, manufactured by Tremco Incorporated.
 - 6) Approved equal.
- G. Grout - Pitch Pans:
 - 1. Type: Quick-setting, non-shrink, non-metallic, high strength formula complying with ASTM C1107.
 - 2. Approved products/manufacturers:
 - a. Sure Grip High Performance Grout, manufactured by Dayton Superior Corporation.
 - b. Premier Quick-Trim, manufactured by L & M Construction Chemicals, Inc.
 - c. Masterflow, manufactured by Master Builders, Inc.
 - d. Sonnogrout 10K, manufactured by Sonneborn Building Products.

- e. Approved equal.
- H. Pitch Pan Filler:
 - 1. Type: Pourable polyurethane sealer, approved by roofing system manufacturer.
 - 2. Approved products/manufacturers:
 - a. Quick Pitch Sealer, manufactured by U.S. Intec.
 - b. SPM Pourable Sealer, manufactured by Johns Manville.
 - c. Approved equal.
- I. Termination Bar:
 - 1. Material: Extruded aluminum bar with flat profile.
 - 2. Size: 1/8-inch thick by one-inch (1") wide with factory punched 1/4-inch by 3/8-inch oval holes spaced six inches (6") on center.
 - 3. Approved product/manufacturer:
 - a. TB 125, manufactured by TruFast Corp.
 - b. Approved equal.
- J. Pipe Hangers and Supports: Refer to Section 07 72 00: Roof Accessories.
- K. Splash Blocks: Concrete type, of size and profiles indicated; minimum 3,000 psi compressive strength at 28 days, with minimum five percent (5%) air entrainment. Use at locations where roof drainage dumps on ground.
- L. Splash Pans: 22-gauge stainless steel, of size and profiles indicated. Use at locations where roof drainage discharges over adjoining, lower roof level(s).
- M. One-Way Moisture Relief Vents: Shall be fabricated from spun aluminum as recommended by roofing manufacturer.

2.5 FABRICATION

- A. Except as otherwise indicated, fabricate work in accordance with SMACNA Architectural Sheet Metal Manual and other recognized industry practices and reviewed shop drawings. Form all flashings, receivers, and counterflashings in accordance with standards set forth in the NRCA roofing manual and SMACNA.
- B. Comply with manufacturer's installation instructions and recommendations.
- C. Unless noted otherwise, fabricate perimeter edge/fascia, scuppers, gutters, downspouts, copings, counterflashings, wind clips, and trim from pre-finished aluminum sheet steel.
- D. Shop fabricate work to greatest extent possible. Fabricate inside and outside corners for metal edges, counterflashing, and coping caps of equal length – minimum two-foot (2') lengths.
- E. Fabricate items to size and dimensions as indicated on the Drawings. Limit single-piece lengths to ten feet (10').
- F. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work sufficient to permanently prevent leakage, damage, or deterioration of the work.

- G. Integrate flashing in a manner consistent with detailing. Form work to fit substrates.
- H. Make angle bends and folds for interlocking metal with full regard for expansion and contraction to avoid buckling or fullness in metal after installation.
- I. Fabricate items with straight lines, sharp angles, smooth curves, and true levels. Avoid tool marks, buckling, and oil canning.
- J. Fold back edges on concealed side of exposed edge to form hem.
- K. Unless noted otherwise, lap joints minimum one inch (1"). Rivet and solder joints on parts that are to be permanently and rigidly assembled.
- L. Seams:
 - 1. Wherever possible, fabricate non-moving seams in sheet metal with flat-lock seams and end joints.
 - 2. Pre-finished galvanized steel: Seal pre-finished metal seams with rivets and silicone sealant.
 - 3. Metal other than aluminum: Tin edges to be seamed, form seams, and solder.
- M. On Kynar 500 or Hylar 5000 pre-finished metal, surface sand metal flanges prior to applying any primers. Prime all metal in contact with bituminous material.
- N. Back-paint all concealed metal surfaces with bituminous paint where expected to be in contact with cementitious materials or dissimilar metals.
- O. Expansion Provisions: Where lapped or bayonet type expansion provisions in work cannot be used or would not be sufficiently waterproof or weatherproof, form expansion joints of intermeshing hooked flanges, not less than one-inch (1") deep filled with mastic sealant concealed within joints.

2.6 FABRICATED ITEMS

- A. Metal Flashings (Minimum ten-foot [10'] lengths):
 - 1. Through wall receiver tray: Minimum 24-gauge stainless steel, through wall receivers shall not extend past the face of the exterior veneer more than 3/4 inch.
 - 2. Counterflashing: Minimum 24-gauge stainless steel.
- B. Wind Clips: Minimum 24-gauge stainless steel (or match material of counterflashing), one-inch (1") wide by length to engage counterflashing a minimum of 1/2 inch. To be installed at all wall flashings and at curb flashing lengths longer than five feet (5').
- C. Roof Penetrations:
 - 1. Umbrella counterflashing: Two-piece construction of minimum 24-gauge stainless steel, fabricated in accordance with Drawings or Project requirements.
 - c. Fabricate metal bonnets for all pans, no exceptions. Fabricate bonnets with metal compatible with metal to which bonnet is to be attached. On beams and other steel, weld in place bonnets fabricated from 1/4-inch steel plate. Draw band bonnets fabricated from 22-gauge stainless steel may be used on circular projections.
- D. Metal Edge:

1. Minimum 24 gauge pre-finished galvanized metal formed in maximum ten (10) foot lengths, with six (6) inch wide cover plates of same profile, four (4) inch flange, maximum seven (7) inch fascia, including a 3/4 inch gravel stop. For fascias over (7) inches a two (2) piece fascia with separate cleat will be required.
 2. Provide expansion slip joints at maximum 20 feet on center.
 3. Shop fabricate all interior and exterior corners. Fabricate exterior corners with 18-inch minimum to four-foot (4') maximum legs. Lap, rivet, and seal prior to delivery to jobsite.
 4. Fabricate to sizes and dimensions as indicated on Drawings with a minimum one-inch (1") coverage past top of wall. Refer to SMACNA Fig. 2-5A.
 5. Provide mock-up for Architect's approval prior to fabrication.
- E. Continuous Cleats: Continuous strips, same material and profile, minimum one (1) gauge heavier of item to which cleats attach.
- F. Vent Hoods, Sleeves, Penetration Flashings, and Accessories: Minimum 24-gauge stainless steel, or as shown or directed otherwise.
- G. Angle Termination Bar: Aluminum pressure bar 1/8 inch by one inch (1").
- H. Vent Pipe Flashing: Four (4) pound lead. Provide proper size to fold down inside of pipe a minimum of one inch (1").
- I. Roof Drain Flashing: Four (4) pound lead, minimum 30 inches by 30 inches.
- J. Coping:
1. Minimum 0.040-inch thick pre-finished aluminum, with six-inch (6") wide cover plates of same profile.
 2. Fabricate as outlined in SMACNA; Refer to Figure 3-4 A.
 3. Provide tapered substrate to slope to one (1) side, and cover with waterproof membrane.
 4. Install with continuous cleat one (1) side and fasten other side.
- K. Gutters/Downspouts/Collector Heads:
1. Gutters: Minimum 0.048-inch thick pre-finished aluminum formed in maximum ten-foot (10') lengths, with six-inch (6") wide cover plates. Minimum five-inch by six-inch (5" x 6") box gutter (verify size meets rainfall data per SMACNA).
 2. Gutter/downspout straps: Minimum 0.040-inch thick pre-finished (match color) aluminum. Hem both sides.
 3. Gutter supports: Minimum 0.064-inch thick pre-finished (match color) aluminum hemmed around 1/8-inch galvanized bent steel bracket.
 4. Gutter screen: Stainless steel 1/4-inch diamond wire screen enclosed in a pre-finished frame.
 5. Collector heads: Minimum 0.040-inch thick pre-finished (match color) aluminum. As outlined in SMACNA; Refer to Figure 1-25F and Figure 1-28 with alternate Section A-A.
- L. Pipe Box Cover: 24-gauge stainless steel.
- M. Heat Exhaust Curbs and Hoods: 22-gauge stainless steel.
- N. Expansion Joint Cover: Minimum 24-gauge stainless steel (provide pre-finished metal at perimeter edge end termination.)

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify substrates are smooth and clean to extent required to perform sheet metal work.
- B. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set in place.
- C. Verify that reglets, nailers, cants, and blocking to receive sheet metal are in place and free of concrete and soil.
- D. Do not start work until conditions are satisfactory.

3.2 PREPARATION

- A. Field measure site conditions prior to fabrication work.
- B. Install starter and edge strips and cleats before starting installation.

3.3 INSTALLATION

- A. Install sheet metal with lines, arises, and angles sharp and true, and plane surfaces free from objectionable wave, warp, or buckle. Exposed edges of sheet metal shall be folded back to form 1/4-inch hem on concealed side from view. Finished work shall be free from water retention and leakage under all weather conditions. Pre-fabricated corners or transitions are required at changes in direction, elevation, or plane and at intersections. Locate field joints not less than 12 inches, nor more than three feet (3') from actual corner. Laps shall be one inch (1"), riveted and soldered at following locations:
 - 1. Pre-fabricated corners.
 - 2. Transitions.
 - 3. Changes in direction, elevation, and plane.
 - 4. At intersections.
- B. Anchor units of work securely in place to prevent damage or distortion from wind or buckling. Provide for thermal expansion of metal units; conceal fasteners wherever possible; and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight and weatherproof.
- C. Install fabricated sheet metal items in accordance with manufacturer's installation instructions and recommendations with SMACNA Architectural Sheet Metal Manual.
- D. Separations: Provide for separation of metal from dissimilar metal or corrosive substrates by coating concealed surfaces with zinc chromate, bituminous coating, or other permanent separation at locations of contact as recommended by manufacturer or fabricator. Do not use materials that are incompatible with roofing system.
- E. Continuous Cleat: At exposed edges of perimeter edge, fascias, cap flashings, and where required, attach continuous cleat at six inches (6") on center with appropriate fasteners.
- F. Gravel Guard/Fascia:
 - 1. Install with expansion joints ten feet (10') o.c., 1/2-inch expansion leeway, with cover

- plate.
 - 2. Set in asphalt mastic and fasten into nailer at three inches (3") o.c. staggered.
 - 3. Buff sand Kynar surface of flange and prime.
 - 4. Strip in flange with specified stripping plies set in hot bitumen extending three inches (3") from outer edge of flange to at least three inches (3") inward towards gravel stop. Provide finish stripping ply of modified bitumen base ply in hot bitumen extending six inches (6") from the outer edge of the flange and butt base of gravel stop.
- G. Counterflashing:
- 1. Do not use surface mount counterflashing except as noted in Drawings.
 - 2. Set in through wall with receiver and spring lock counterflashing, as detailed in Drawings and to NRCA roofing manual, SMACNA standards.
 - 3. Coordinate installation of through-wall flashing with the masonry contractor.
 - 4. Seal through-wall in conjunction with masonry wall waterproofing.
 - 5. Install wind clips 30 inches o.c. at all counterflashing over five feet (5') in length.
- H. Pitch Pans, Metal Flanges:
- 1. Apply mastic under pitch pan or metal flashing flange at least 1/2 pound per linear foot.
 - 2. Prime all metal flanges with asphalt primer prior to flashing installation.
 - 3. Clean all projections enclosed in pitch pans in any manner suitable and coated with a rust inhibitive coating as approved by the Architect. Coating shall be allowed to dry prior to pitch pan fill.
 - 4. Fill base of pitch pans with grout or cementitious binder and allow to cure.
 - 5. Top Finish Fill: Self-leveling, one-part urethane; at least two inches (2") to top of pitch pan sides.
 - 6. Strip in pitch pan flanges with two (2) strips of specified stripping plies set in hot bitumen extending three inches (3") from the outer edge of the flange to at least three inches (3") inward toward base of pitch pan. Provide finish stripping ply of SBS modified bitumen membrane in hot bitumen extending six inches (6") from the outer edge of the flange and butt to base of pitch pan.
- I. Sanitary Vent Stacks:
- 1. Prime top and bottom flanges of lead flashing sleeve. Set flange in uniform troweling of plastic roof cement. Prime top side of flange to receive strip-in membrane.
 - 2. Fold lead sleeve down inside of pipe a minimum of one inch (1"). Apply a continuous bead of sealant on inside of pipe prior to folding lead sleeve.
- J. Roof Drains:
- 1. After membrane installation, prime bottom of lead flashing sheet and set in uniform bed of plastic roof cement at specified locations.
 - 2. Extend lead flashing into drain bowl or pipe a minimum of two inches (2") and over top of piping/bowl connection, if possible. Apply a continuous bead of specified Type A sealant, at intersection of pipe and drain bowl.
 - 3. If drain bowl and pipe connection is contaminated with bituminous material, strip-in area with three-coursing of plastic roof cement and fabric.
 - 4. Prime top of lead flashing sheet to receive strip-in membrane.
- K. Gutters/Downspouts:
- 1. Install gutters as detailed.
 - 2. Install downspouts plumb and level and attached to columns or wall with straps located at top and bottom of downspout and maximum ten feet (10') on center.
 - 3. Install splash pad or block under discharge port of downspouts. Install splash pan over a protection (walkway) pad for downspouts located at roof level.

4. End caps, downspout outlets, gutter and downspout straps, support brackets, and joint fasteners to be manufactured to suit profile and dimension of gutter and downspout.
 5. Install all anchoring devices as outlined in SMACNA.
 6. Expansion joints: Lap or butt type per SMACNA, locate every 50 linear feet.
- L. Expansion Joint:
1. Construct wood curbs as shown on Drawings and as outlined in the NRCA and SMACNA manuals.
 2. Install underlayment, form envelope, and secure underlayment to curb. Fill envelope with compressible insulation.
 3. Securely fasten expansion joint cover to curb with grommetted fasteners spaced six inches (6") on center.
 4. Taper expansion joint down at the metal edge.
- M. Coping:
1. Install wood nailers as shown on Drawings.
 2. Install metal cleats with appropriate fasteners spaced six inches (6") on center.
 3. Install underlayment over the wood substrate. Lap ends minimum of six inches (6") and secure membrane in place. Seal laps with appropriate adhesive.
 4. Install metal coping allowing 1/2-inch spaces between segments. Lock coping onto cleat and install appropriate fasteners through the interior fascia spaced 24 inches on center in enlarged holes.
 5. Install cover plate centered over coping joint in continuous beads of specified Type B sealant, placed approximately one inch (1") from cover edges. Refer to SMACNA for alternate joints as required by length.
 6. Install appropriate fastener through neoprene washer and cover plate between coping segments.
 7. Accommodate building wall expansion joints by terminating coping joints and cleats either side of expansion joint. Do not run coping or cleats continuous across joints. Install coping cover plate to span across joint and lap coping on each side of joint a minimum of four inches (4"). Fasten cover plate on one (1) side of joint only (provide wall flashing membrane up and over parapet wall in accordance with manufacturer's detail).

3.4 CLEANING AND PROTECTION

- A. Remove flux and residual acid immediately by neutralizing with baking soda and washing with clean water. Leave work clean of stains.
- B. Remove scraps and debris and leave work area clean.
- C. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes. Paint areas where finish is damaged on pre-finished metal by painting with a compatible paint in color to match undamaged finish.
- D. Prime soldered area of phosphatized metal after cleaning to prevent rusting.
- E. Paint metal flashings that have been soiled with bitumen with aluminized paint.

- F. Clean other work damaged or soiled by work of this Section.
- G. Protect finished work from damage.

END OF SECTION 07 62 00

SECTION 07 72 00 ROOF ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Drawings and Conditions of Contract, including General and Supplementary Conditions and Division 1 Administration Sections, apply to this Division.

1.2 INSTALLATION RESPONSIBILITY

- A. In addition to the items normally a part of this Section, coordinate the installation of roof accessory curbs and pipe flashing and equipment supports that may be specified elsewhere.
- B. Coordinate the work specified herein with the following Work:
 - 1. Roofing
 - 2. Roofing sheet metal
 - 3. Mechanical equipment
 - 4. Plumbing
- C. Related Sections:
 - 1. Section 07 62 00: Roof Related Sheet Metal.

1.3 SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.
- C. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - 1. Size and location of roof accessories specified in this Section.
 - 2. Method of attaching roof accessories to roof or building structure.
 - 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.5 WARRANTY

- A. Warranty the Work specified herein for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.

- B. Defects shall include, but not be limited to, the following:
 - 1. Noticeable deterioration of finish
 - 2. Leakage of water into the building or within the construction.
- C. Rooftop supports – 5 year limited warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Specifications are based on products of named manufacturers. Other manufacturers must have a minimum of five (5) years' experience manufacturing products meeting or exceeding the specifications and comply with Division 01 requirements regarding substitutions to be considered.

2.2 PREFABRICATED ROOF CURBS

- A. Approved Manufacturers:
 - 1. Bilco <http://www.bilco.com/home.asp>.
 - 2. Milcor <http://www.commercialproductsgroup.com/products/milcor.aspx>.
 - 3. Or approved equal.
- B. Aluminum, 36-inch by 36-inch self-flashing curb with mill finish (minimum opening).
- C. Hatches to have compression springs or gas loaded struts.
- D. Covers to be rated to 40 PSF, lockable from inside, and insulated.
- E. Provide safety post for ladders.
- F. Provide rail guards three sides with chain on fourth side.

2.3 PIPE SUPPORTS

- A. Gas Pipe Supports:
 - 1. Lines less than 3" OD: (non penetrating)
 - a. Provide strut and hanger type support with recycled plastics and carbon black for UV protection bases (10 inches x 16 inches x 3 inches; 6 lbs. each); Model Type 10-RAH-8 with strut, roller hanger and hold down clips for lines 2-1/2 inches and smaller
 - 2. Lines 3" OD or larger: (non penetrating)
 - a. Provide strut and hanger type support with recycled plastics and carbon black for UV protection bases (18 inches x 16 inches x 3 inches; 10 inches x 16 inches x 3 inches; minimum 6 lbs. each); Model Type Model 8H-CP (Miro) with hanger and roller chair
 - 3. Approved Manufacture:
 - a. Miro Industries, Inc.
 - b. Portable Pipe Hanger, Inc.
 - c. MAPA Products
 - d. Architectural approved equal
- B. Electrical Conduit / Condensate Lines:

1. Lines less than 3" OD: (non penetrating)
 - a. Provide strut type support with recycled plastics and carbon black for UV protection bases (10 inches x 16 inches x 3 inches; 6 lbs. each), Model Type 16-Base Strut-8
 2. Lines 3" OD or larger: (non penetrating)
 - a. Provide strut and hanger type support with recycled plastics and carbon black for UV protection bases (18 inches x 16 inches x 3 inches; 10 inches x 16 inches x 3 inches; minimum 6 lbs. each); Model Type Model 8H-CP (Miro) with hanger
 3. Approved Manufacture:
 - a. Miro Industries, Inc.
 - b. Portable Pipe Hanger, Inc.
 - c. MAPA Products
 - d. Architectural approved equal
- C. Chill Water Lines/Freon line sets:
1. Lines less than 3" OD: (non penetrating)
 - a. Provide strut and hanger type support with recycled plastics and carbon black for UV protection bases (10 inches x 16 inches x 3 inches; 6 lbs. each); Model Type 10-RAH-8 with strut, roller hanger and hold down clips for lines 2-1/2 inches and smaller,
 2. Lines 3" OD or larger: (non penetrating)
 - a. Provide strut and hanger type support with recycled plastics and carbon black for UV protection bases (18 inches x 16 inches x 3 inches; 10 inches x 16 inches x 3 inches; minimum 6 lbs. each); Model Type Model 8H-CP (Miro) with hanger and roller chair
 3. Approved Manufacture:
 - a. Miro Industries, Inc.
 - b. Portable Pipe Hanger, Inc.
 - c. MAPA Products
 - d. Architectural approved equal

PART 3 EXECUTION

3.1 INSTALLATION

- A. Non-Penetrating pipe supports: Install roof accessory in accordance with manufacturer's printed instructions and approved shop drawings.
 1. Spacing not to exceed six (6) feet on center between seismic support curbs. With in twelve (12) inches from any change in direction or elevation not support by seismic curb.
 2. Provide roof manufacture protection pad below each support, tacked in place with approved mastic or adhesive.
 3. Install hold down clips or guides to ensure piping to stay in contact with roller support or Unistrut.

3.2 CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION 07 72 00

SECTION 07 84 00 FIRESTOPPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Penetration firestop systems.
 - 2. Fire resistive joint systems.
 - 3. Repair of firestop assemblies disturbed by the work.
 - 4. Smoke barriers.
 - 5. Accessories necessary for a complete installation.
- B. Related Sections:
 - 1. Section 07 92 00: Joints Sealants.
 - 2. Division 23: Heating, Ventilating & Air Conditioning (HVAC).
 - 3. Division 26: Electrical.
- C. Reference Standards:
 - 1. Part 1 2022 California Administrative Code, Title 24 C.C.R.
 - 2. Part 2 2022 California Building Code, Title 24 C.C.R.
 - 3. Part 3 2022 California Electrical Code, Title 24 C.C.R.
 - 4. Part 4 2022 California Mechanical Code, Title 24 C.C.R.
 - 5. Part 5 2022 California Plumbing Code, Title 24 C.C.R.
 - 6. Part 6 2022 California Energy Code, Title 24 C.C.R.
 - 7. Part 8 2022 California Historical Code, Title 24 C.C.R.
 - 8. Part 9 2022 California Fire Code, Title 24 C.C.R.
 - 9. Part 10 2022 California Existing Building Code, Title 24 C.C.R.
 - 10. Part 11 2022 California Green Building Standards Code (CALGreen Code), Title 24 C.C.R.
 - 11. Part 12 2022 California Referenced Standards Code, Title 24 C.C.R.
 - 12. NFPA 13 Automatic Sprinkler Systems (California Amended), Current Edition.
 - 13. NFPA 14 Standpipe Systems (California Amended), Current Edition.
 - 14. NFPA 17 Dry Chemical Extinguishing Systems, Current Edition
 - 15. NFPA 20 Stationary Pumps, Current Edition.
 - 16. NFPA 24 Private Fire Service Mains (California Amended), Current Edition.
 - 17. NFPA 72 National Fire Alarm and Signaling Code (California Amended) Current Edition (Note: See UL Standard 1971 for Visual Devices).
 - 18. NFPA 80 Fire Door and Other Opening Protectives, Current Edition.
 - 19. NFPA 253 Critical Radiant Flux of Flooring Covering Systems, Current Edition.
 - 20. NFPA 2001 Clean Agent Fire Extinguishing Systems (California Amended), Current Edition.
 - 21. Americans with Disabilities Act (ADA), Title II.
 - 22. Fire Test Response Characteristics:
 - a. Provide firestop systems complying with requirements:
 - 1) Penetration firestop systems are identical to those tested in accordance with UL. Provide rated systems complying with requirements:
 - a) Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.

- b) Penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - c) Penetration firestop systems correspond to those indicated by reference to penetration firestop system designations listed by UL in its Fire Resistance Directory and FM Global in its Building Materials Approval Guide.
- b. Fire Resistive Joints:
 - 1) Perform fire resistance tests by UL with follow up inspection services for fire resistive joint systems acceptable to authorities having jurisdiction:
 - a) Fire resistive joint system products bear classification marking of qualified testing and inspecting agency.
 - b) Fire resistive joint systems correspond to those indicated by reference to penetration firestop system designations listed by UL in its Fire Resistance Directory.

1.3 SUBMITTALS

- A. Product Data: Technical data including installation recommendations, construction conditions, and applicable UL assemblies.
- B. Shop Drawings:
 - 1. For each penetration firestop or fire resistive joint system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetration. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated:
 - a. Submit documentation, including illustrations, from qualified testing and inspecting agency, applicable to each firestop system configuration for construction and penetrating items.
- C. Product Certificates: For penetration firestop system products, signed by product manufacturer.
- D. Product Test Reports: From a qualified testing agency indicating penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.4 PERFORMANCE REQUIREMENTS

- A. Penetration Fire Resistance Systems:
 - 1. For penetrations through vertical and horizontal fire resistance rated constructions, including both empty openings and openings containing penetrating items, provide firestop systems produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and gases, and maintain original fire resistance rating of construction penetrated.
 - 2. Rated systems:
 - a. Provide penetration firestop systems with ratings determined in accordance with UL 1479 for C-AJ, C-BJ, C-BK, F-A, F-B, F-C, W-J, W-K, and W-L classified systems:
 - 1) F rated systems: Provide penetration firestop systems with F ratings indicated, but not less than that equaling or exceeding fire resistance rating of constructions penetrated.
 - 2) T rated systems: For specified conditions, provide penetration firestop systems with T ratings indicated, as well as F ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas.
 - 3) L rated systems: Where penetration firestop systems are indicated in smoke

- barriers, provide penetration firestop systems with L ratings of not more than 3.0 cfm/sq. ft (0.01524cu. m/s x sq. m) at both ambient temperatures and 400 degrees F (204 degrees C).
- 4) For penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to conditions both during and after construction.
- 5) For piping penetrations for plumbing and wet pipe sprinkler systems, provide moisture resistant penetration firestop systems.
- 6) For penetrations involving insulated piping, provide penetration firestop systems not requiring removal of insulation.
- 3. For penetration firestop systems exposed to view, provide products with flame spread and smoke developed indexes of less than 25 and 450, respectively, determined in accordance with ASTM E84.
- B. Fire Resistive Joint Systems:
 - 1. System produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and gases, and maintain original fire resistance rating of assembly in which fire resistive joint systems are installed:
 - a. Joint systems in and between fire resistance rated constructions: Provide systems with assembly ratings equaling or exceeding fire resistance ratings of construction that are joined, with movement capabilities and L ratings indicated determined by UL 2079.
 - b. Perimeter fire resistive joint systems: For joints between edges of fire resistance rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated, determined by NFPA 285 and UL 2079.
 - c. For fire resistive systems exposed to view, provide products with flame spread and smoke developed indexes of less than 25 and 450, respectively, determined in accordance with ASTM E84.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. A firm experienced in installing firestop systems and who has been approved by FM Global according to FM Global 4991 Approval of Firestop Contractors or been evaluated by UL and found to comply with UL Qualified Firestop Contractor Program Requirements and has minimum five (5) years' documented experience in installing firestopping assemblies:
 - a. Manufacturer's willingness to sell its penetration firestop system products to Contractor or to installer engaged by Contractor does not qualify buyer/installer.
- B. Installation Responsibility: Assign installation of penetration firestop systems and fire resistive joint systems to a single qualified installer.
- C. Source Limitations: Obtain firestop systems for each kind of penetration and construction condition indicated; one (1) source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestop system products to site in original, unopened containers or packages with intact and legible manufacturer labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturer:
 - 1. Subject to compliance with requirements, provide firestop systems by one of the following for each application required:
 - a. Specified Technologies Inc
 - b. Hilti, Inc.
 - c. 3M; Fire Protection Products Division.
 - d. USG Corporation.
 - e. Tremco Commercial Sealants and Waterproofing.
- B. Compatibility: Provide firestop systems compatible with each other; with substrates forming openings; and with items penetrating penetration firestop systems, under conditions of service and application, demonstrated by penetration firestop system manufacturer based on testing and field experience.
- C. Accessories:
 - 1. Provide components for each firestop system necessary to install fill materials. Use components specified by penetration firestop or fire resistive joint system manufacturer and UL. Accessories include, but are not limited to:
 - a. Penetration firestop systems: Provide penetration firestopping produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and gases, and maintain original fire resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with substrates forming openings, and with penetrating items if any.
 - b. Accessories - Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated:
 - 1) Permanent forming/damming/backing materials, including the following:
 - a) Slag wool fiber or rock wool fiber insulation.
 - b) Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c) Fire rated form board.
 - d) Fillers for sealants.
 - 2) Temporary forming materials.
 - 3) Substrate primers.
 - 4) Collars.
 - 5) Steel sleeves.
- D. Fill Materials:
 - 1. Penetration firestop systems containing types of fill materials indicated. Fill materials are those referenced in directories of referenced testing and inspecting agencies as fill, void, or cavity materials:
 - a. Cast in place firestop devices: Factory assembled devices for use in cast in place concrete floors and consisting of an outer metallic sleeve lined with intumescent strip, radial extended flange attached to one end of sleeve for fastening to concrete formwork, and neoprene gasket.
 - b. Latex sealants: Single component latex formulations that after cure do not reemulsify during exposure to moisture.
 - c. Firestop devices: Factory assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
 - d. Intumescent composite sheets: Rigid panels consisting of aluminum foil faced

- elastomeric sheet bonded to galvanized steel sheet.
 - e. Intumescent putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
 - f. Intumescent wrap strips: Single component intumescent elastomeric sheets with aluminum foil on one side.
 - g. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at site to form non-shrinking, homogeneous mortar.
 - h. Pillows/bags: Reusable heat expanding pillows/bags consisting of glass fiber cloth cases filled with combination of mineral fiber, water insoluble expansion agents, and fire-retardant additives.
 - i. Silicone foams: Multicomponent, silicone based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.
 - j. Silicone sealants - single component, silicone based, neutral curing elastomeric sealants of grade indicated:
 - 1) Grade: Pourable (self-leveling) formulation for openings in floors and horizontal surfaces, and non-sag formulation for openings in vertical and surfaces requiring nonslumping, gunnable sealant, unless indicated firestop system limits use to non-sag grade for both opening conditions.
- E. Fire Resistive Joint Systems: Sealants complying with UL 1479 including F, T, and L ratings.
- F. Fire Safing Insulation:
 - 1. Semi-refractory blanket: Semirigid blankets designed for use as fire stops at openings between edge of slab and exterior wall panels, glass mat faced, low density; having nominal density of 4 lb/cu. ft. (64 kg/cu. m); complying with ASTM C612, Type 1A and 1B and ASTM E136 for combustion characteristics; thermal resistivity of four (4) degrees F x h x sq. ft./Btu x in. at 75 degrees F (27.7 K x m/W at 24 degrees C); with maximum flame spread and smoke developed values of 10 and 5. Use for floor perimeter fire and smoke containment. Install blanket with 20-gauge impaling clips recommended by manufacturer.
 - 2. Caulking compound: Material approved by manufacturer of safing insulation for sealing joint between foil backing of safing insulation and edge of concrete floor slab against penetration of smoke.
 - 3. Safing clips: Galvanized steel safing clips approved by manufacturer of safing insulation for holding safing insulation in place.
- G. Duct Wrap for Ducts: Materials listed in the UL Fire Resistance Directory under File R8418, Category CAJ7009, File R14229 Categories CAJ 7013, CAJ 7015, CAJ 7020, CAJ 7022, YYET, and grease duct enclosures and having minimum two (2) hour fire resistive rating for grease or air duct enclosure materials.
- H. Composition Edge Banding: Materials listed in UL Fire Resistance Directory UL 10C standard.

2.2 FIRE STOPPING SYSTEMS

- A. Penetration System:
 - 1. Penetrations in fire resistance rated walls - provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa):
 - a. Fire resistance rated walls include fire walls, fire barrier walls, smoke barrier walls, and fire partitions.
 - b. F Rating: Minimum fire resistance rating of constructions penetrated.
 - 2. Penetrations in horizontal assemblies - provide penetration firestopping with ratings

determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa):

- a. Horizontal assemblies include floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
 - b. F rating: At least one (1) hour, but not less than the fire-resistance rating of constructions penetrated.
 - c. T rating: At least one (1) hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. Penetrations in smoke barriers:
 - a. Provide penetration firestopping with ratings determined per UL 1479:
 - 1) L rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.
 - 2) W rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
 4. Exposed penetration firestopping: Provide products with flame-spread and smoke developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.
- B. Joint Resistive Systems:
1. Joints in smoke barriers:
 - a. Provide fire resistive joint systems with ratings determined per UL 2079:
 - 1) L rating: Not exceeding 5.0 cfm/ft (0.00775 cu. m/s x m) of joint at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.
 2. Exposed fire resistive joint systems: Provide products with flame-spread and smoke developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.
 3. Exposed fire-resistive joint systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

2.3 MIXING

- A. For products requiring mixing before application, comply with penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install firestop systems when ambient or substrate temperatures are outside limits permitted by firestop system manufacturer or when substrates are wet due to rain, frost, condensation, or causes.
- B. Install and cure fire resistive joint systems in accordance with manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced air circulation.
- C. Ventilate firestop systems per manufacturer's written instructions by natural means or, where inadequate, forced air circulation.

3.2 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that firestop resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core drilled holes, or cut openings to accommodate penetration firestop systems.
- C. Joint System: Coordinate sizing of joints to accommodate fire resistive joint systems.
- D. Do not cover up penetration firestop system or fire resistive joint system installations that will become concealed behind other construction until building inspector of authorities having jurisdiction have examined each installation.

3.3 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and conditions affecting performance of work. Proceed with installation after unsatisfactory conditions have been corrected.

3.4 PREPARATION

- A. Surface Cleaning:
 - 1. Clean out openings immediately before installing penetration firestop systems complying with firestop system manufacturer's written instructions and with the following requirements:
 - a. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestop systems.
 - b. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestop systems. Remove loose particles remaining from cleaning operation.
 - c. Remove laitance and form release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by penetration firestop system manufacturer complying with manufacturer's recommended. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of work and that would be permanently stained or damaged by contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.5 INSTALLATION

- A. Penetration Firestop System:
 - 1. Install penetration firestop systems to comply with requirements and with firestop system manufacturer written installation instructions and published drawings for products and applications indicated:
 - a. Install forming/damming/backing materials and accessories of types required to support fill materials during application and in the position needed to produce cross sectional shapes and depths required to achieve fire ratings indicated. After installing fill materials and allowing them to fully cure, remove combustible forming materials and accessories not indicated as permanent components of firestop

- systems.
- b. Install fill materials for firestop systems by proven techniques to produce results:
 - 1) Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire resistance ratings indicated.
 - 2) Apply materials for full contact and adhere to substrates formed by openings and penetrating items.
 - 3) For fill materials that remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- B. Fire Resistive Joint System:
 1. Install fire resistive joint systems to comply with requirements and manufacturer's written installation instructions for products and applications indicated:
 - a. Install forming/packing/backing materials and accessories of types required to support fill materials during application and in position needed to produce cross sectional shapes and depths required to achieve fire ratings indicated.
 - b. Install fill materials for joint systems by proven techniques to produce the following results:
 - 1) Fill voids and cavities formed by openings and forming/packing/backing materials required to achieve fire resistance ratings indicated.
 - 2) Apply fill materials to contact and adhere to substrates formed by joints.
 - 3) For fill materials remaining exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.6 IDENTIFICATION

- A. Identify firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within six inches (150 mm) of edge of the firestop systems so labels are visible at removal:
 1. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces and, in combination with label material, resulting in partial destruction of label if removal is attempted. Include information on labels:
 - a. The words Warning - Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage.
 - b. Contractor's name, address, and phone number.
 - c. Firestop system designation of applicable testing and inspecting agency.
 - d. Date of installation.
 - e. Penetration firestop system manufacturer's name.
 - f. Installer's name.

3.7 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or fire resistive joint systems are damaged or removed due to testing, repair or replace fire resistive joint systems so they comply with requirements.
- C. Proceed with enclosing fire resistive joint systems with construction after inspection reports are issued and installations comply with requirements.
- D. Provide where required by code annual inspection of all fire resistive joint systems and recommendations for improvements. Include reporting with final documentation at end of project.

3.8 CUTTING AND PATCHING

- A. Cut, patch, and repair firestopping to accommodate work. Repair cracks and indented surfaces. Repair surfaces around items built into or that penetrate surfaces. Repair and replace work to eliminate blister, buckles, dry outs, and similar imperfections. Repair and replace work required to comply with fire resistance ratings.
- B. After completion of work in and around the areas of firestopping, repair and replace damaged firestopping.

3.9 CLEANING AND PROTECTION

- A. Clean excess fill materials adjacent to openings as work progresses by methods and with cleaning materials approved in writing by penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation ensuring penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestop systems immediately and install new materials to produce systems complying with requirements.

END OF SECTION 07 84 00

SECTION 07 92 00 JOINT SEALANTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Control and expansion joints on exposed interior and exterior surfaces.
 - 2. Perimeter joints between wall surfaces and frames of interior and exterior doors and openings.
 - 3. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - 4. Joints indicated or as necessary.
 - 5. Accessories necessary for a complete installation.
- B. Related Sections:
 - 1. Section 03 30 00: Cast-In-Place Concrete
 - 2. Section 05 50 00: Metal Fabrications.
 - 3. Section 07 84 00: Firestopping.
 - 4. Section 08 11 13: Hollow Metal Doors and Frames.
 - 5. Section 08 80 00: Glazing.
 - 6. Section 09 90 00: Painting and Coating.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Technical data for each joint sealant product. Data to indicate elasticity and durability of each joint sealant product. Submit written certification from manufacturers of sealants attesting products are suitable for use indicated, verified through in-house testing laboratory:
 - a. Written certification from manufacturers of joint sealants attesting that products comply with specification requirements and suitable for use indicated verified through manufacturers testing laboratory within the past 36 months or since most recent reformulation, whichever is most recent:
 - 1) Complete instructions for handling, storage, mixing, priming, installation, curing, and protection of each type of sealant.
 - 2) Manufacturer's letter, clearly indicating proposed lot numbers of each sealant supplied and expiration date sequence.
 - 2. Recycled Content:
 - a. Indicate recycled content; indicate percentage of pre-consumer and postconsumer recycled content per unit of product.
 - b. Indicate relative dollar value of recycled content product to total dollar value of product included in Project.
 - c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
 - d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
 - 3. Local/regional materials:

- a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the Project site.
 - b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the Project site.
 - c. Product value: Indicate dollar value of product containing local/regional materials; include materials cost only.
 - d. Product component(s) value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
 4. VOC data: Submit manufacturer's product data for sealants. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.
 5. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.
- B. Samples:
1. Provide color samples from full manufacturer's full range for each type of sealant specified for Architect's review.
- C. Certificates and Reports:
1. Product Certificates: Manufacturer's product certificate for each kind of joint sealant and accessory.
 2. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
 3. Product test reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
 4. Preconstruction compatibility and adhesion test reports:
 - a. From sealant manufacturer, indicating the following:
 - 1) Materials forming joint substrates and sealant backings have been tested for compatibility and adhesion with sealants.
 - 2) Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
 5. Preconstruction field adhesion test reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified.
 6. Field adhesion test reports: For each sealant application tested.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications:
1. Firm having minimum five (5) years' documented experience and specializes in the installation of sealants:
 - a. Exposed sealant work (sealants used for air and weatherseals external at perimeter, metal panel to panel joints) shall be performed by a single (i.e. one) firm specializing in the installation of sealants who has successfully produced work comparable to Project.
 - b. Concealed sealant work (sealants that are internal to skylights and providing an air seal) shall be the responsibility of the subcontractor providing erection of the respective system.
- B. Source Limitations: Obtain each type of joint sealant from a single manufacturer.
- C. Product Testing:
1. Test joint sealants using a qualified testing agency:

- a. Testing agency qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
 - b. Test according to SWRI Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion in peel, and indentation hardness.
- D. Environmental Requirements:
 - 1. Toxicity/IEQ:
 - a. Comply with applicable regulations regarding toxic and hazardous materials:
 - 1) VOC content of interior sealants - sealants and sealant primers complying with limits for VOC content for SCAQMD when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a) Sealants: 250 g/L.
 - b) Sealant primers for nonporous substrates: 250 g/L.
 - c) Sealant primers for porous substrates: 775 g/L.
 - b. Sealants containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds, are not permitted.

1.5 WARRANTY

- A. Written warranty, signed by installer agreeing to repair or replace elastomeric joint sealant work that has failed to provide a weathertight system within specified warranty period:
 - 1. Warranty period: Five (5) years from date of Substantial Completion.
- B. Written warranties (weatherseal and stain resistance), signed by sealant manufacturer agreeing to furnish joint sealants to repair or replace those that fail to provide airtight and watertight joints, or fail in adhesion, cohesion, abrasion resistance, stain resistance, weather resistance, durability, or appear to deteriorate in manner not specified in the manufacturer's data as an inherent quality of the material within specified warranty period:
 - 1. Warranty period: Five (5) years from date of Substantial Completion.
- C. Warranties specified exclude deterioration or failure of sealants from:
 - 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's written instructions to prevent deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Compatibility: Provide joint sealants, backings, and related materials compatible with one another and with joint substrates under conditions of service and application, as stated by sealant manufacturer's published data, and as substantiated by the manufacturer for each application through testing.
- B. Liquid Applied Sealants: Comply with ASTM C920 and requirements indicated for each liquid applied sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- C. Stain Test Response Characteristics: For sealants in contact with porous substrates, provide nonstaining products that have undergone testing according to ASTM C1248 and do not stain porous joint substrates.
- D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Colors: For fully concealed joints, provide standard color of sealant that has the best overall performance characteristics for the application shown. For exposed joints, submit color samples to Architect for approval, from manufacturer's full line of standard colors.
- F. Manufacturer's Representative: Use sealant produced by manufacturer who agrees to send a qualified technical representative to site upon request for the purpose of rendering advice concerning the recommended installation of manufacturer's materials.
- G. Sealants: Self-leveling compounds for horizontal joints in pavements and non-sag compounds elsewhere except as shown or specified.
- H. Silicone Sealant:
 - 1. Comply with ASTM C920, Type M, Grade NS, Class 25; use NT, M, A and O:
 - a. Use: Typical joints between masonry, metals, glass, and plastics (two-part silicone sealants).
 - b. Properties:
 - 1) Performance: Non-stain, non-bleed, non-streaking to sealed and adjacent substrates. The minimum pli value after seven (7) day immersion shall not be less than 13 when tested in strict accordance with ASTM C794 Adhesion and Peel.
 - 2) Cure system and oil content: Neutral cure system specifically manufactured with controlled oil content to eliminate oil migration into sealed substrates and residue rundown over and onto adjacent substrates.
 - c. Product and manufacturer: Dow Corning; 756 Silicone Building Sealant - HP with Additive.
- I. Silicone Sealant:
 - 1. ASTM C920, Type S, Grade NS, Class 50, for Use NT:
 - a. Use: Typical joints between masonry, metals, glass, and plastics (single component sealants).
 - b. Properties:
 - 1) Performance: Non-stain, non-bleed, non-streaking to sealed and adjacent substrates.

- 2) Cure system and oil content: Neutral cure system specifically manufactured with controlled oil content to eliminate oil migration into sealed substrates and residue rundown over and onto adjacent substrates.
 - c. Product and manufacturer:
 - 1) BASF Building Systems; Omniseal 50.
 - 2) Sika Corporation, Construction Products Division; as applicable
 - 3) Pecora Corporation, as applicable.
 - 4) Comparable product.
- J. Polyurethane Sealants:
1. ASTM C920, Type M, Grade NS, Class 25; use NT, M, A and O:
 - a. Use: Typical Wall and floor joints (two-part polyurethane sealants). Use at concrete joints.
 - b. Properties:
 - 1) Performance: Non-stain, non-bleed, non-streaking to sealed and adjacent substrates.
 - c. Products and manufacturers:
 - 1) BASF Building Systems; Sonolastic NP-2.
 - 2) Pecora Corporation; Dynatred.
 - 3) Sika Corporation, Construction Products Division; Sikaflex 2c NS or Sikaflex 2c NS TG as applicable.
 - 4) Comparable product.
- K. Two-Part Polyurethane Sealants:
1. ASTM C920, Type M, Grade NS, Class 50; use NT, M, A and O:
 - a. Use: Typical Wall and floor joints (two-part polyurethane sealants).
 - b. Properties:
 - 1) Performance: Non-stain, non-bleed, non-streaking to sealed and adjacent substrates. The minimum pli value after seven (7) day immersion shall not be less than 13 when tested in strict accordance with ASTM C794 Adhesion in Peel.
 - c. Products and manufacturers:
 - 1) BASF Construction Chemicals; NP 2.
 - 2) Pecora Corporation, as applicable.
 - 3) Sika Corporation, Inc.; Sikaflex - 2c NS TG.
 - 4) Comparable product.
- L. Mildew Resistant Silicone Sealant:
1. ASTM C920, Type S, Grade NS, Class 25, Use NT, Substrate uses G, A, and O; and containing fungicide for mildew resistance; acid curing:
 - a. Use: One-part mildew-resistant silicone, formulated with fungicide for sealing interior joints of nonporous substrates around ceramic tile, plumbing fixtures, and showers.
 - b. Products - provide one of the following:
 - 1) BASF Building Systems; Omniplus.
 - 2) Pecora Corporation, as applicable.
 - 3) Sika Corporation, Inc., as applicable.
 - 4) Comparable product.
- M. Latex Sealant:
1. Non-elastomeric, one-part, non-sag, paintable latex sealant that is recommended for exposed applications on the interior. Complying with ASTM C834, Type OP (opaque sealants):
 - a. Products are subject to compliance with requirements; provide one of the following:

- 1) BASF; Sonolastic Sonolac.
- 2) Pecora Corporation; AC-20 + Silicone.
- 3) Sika Corporation, Inc., as applicable.
- 4) Comparable product.

N. Acoustical Joint Sealant:

1. Non-sag, paintable, non-staining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90:
 - a. Products are subject to compliance with requirements; provide one of the following:
 - 1) BASF, as applicable.
 - 2) Pecora Corporation; AC-20 FTR or AIS-919.
 - 3) Sika Corporation, Inc., as applicable.
 - 4) Comparable product.

O. Sealant Backing:

1. Provide sealant backings that are non-staining, compatible with joint substrates, sealants, primers, and joint fillers, and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing:
 - a. Cylindrical sealant backings: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding backings of flexible plastic foam complying with ASTM C1330, and of type indicated below. Select shape and density of cylindrical sealant backings in consultation with the manufacturer for proper performance in specific condition of use in each case.
 - b. Type C - closed cell polyethylene foam material with surface skin, nonabsorbent to liquid water and gas, non-outgassing in unruptured state; provide one of the following:
 - 1) BASF, as applicable.
 - 2) Pecora Corporation, as applicable.
 - 3) Sika Corporation, Inc., as applicable
 - 4) Comparable product.

P. Window Glazing:

1. Product Description: Ready to use glazing compound that may be used for face glazing wood or metal sash on existing windows. It is a knife-grade consistency allows for smooth, easy applications. Stick tightly to glass and sash and resists sagging, shrinking and cracking. Follow manufacturers suggested uses.
2. This product is NOT to be used on plastic windowpanes, porcelainized steel insulating panels or any insulated glass units with organic seals, stained or leaded glass. Any window pain over 48 inches in any direction.
3. Listed manufacturer:
 - a. Dap 33 Glazing compound.
 - b. Approved equal.

Q. Miscellaneous Materials:

1. Primer: Material recommended, as verified through compatibility and adhesion testing, by joint sealant manufacturer for the substrates indicated to be sealed.
2. Cleaners for nonporous surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way and formulated to promote optimum adhesion of sealants with joint substrates.
3. Masking tape: Non-staining, non-absorbent material compatible with joint sealants and that will not stain nor mar the finish of surface adjacent to joints to which it is applied.

4. Cork joint filler: Resilient and non-extruding, ASTM D1752, Type II.
5. Bond breaker tape: Polyethylene, TFE fluorocarbon, or plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Limitations:
 1. Do not proceed with installation of joint sealants under the following conditions:
 - a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 degrees F (4.4 degrees C).
 - b. When joint substrates are wet. Should joints or backing materials become wet, remove and replace backing material with new.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

3.2 EXAMINATION

- A. Examine joints indicated to receive joint sealants for compliance with requirements for joint configuration, installation tolerances, and conditions affecting sealant performance. Proceed with installation after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Surface Cleaning of Joints:
 1. Clean out joints immediately before installing joint sealants to comply with the recommendations of joint sealant manufacturer and requirements:
 - a. Remove foreign material from joint substrates interfering with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), existing joint sealants, oil, grease, water, surface dirt, and frost.
 - b. Clean concrete, masonry, unglazed surfaces of tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil free compressed air.
 - c. Remove laitance and form-release agents from concrete.
 - d. Clean metal, glass, porcelain enamel, glazed surfaces of tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming (Elastomeric Sealants Only): Prime joint substrates where recommended in writing by joint sealant manufacturer, based on prior testing and experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.4 INSTALLATION

- A. Silicone Glazing Sealants: Refer to Section 08 80 00: Glazing.
- B. Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- C. Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants applicable to materials, applications, and conditions indicated.
- D. Sealant Backings:
 - 1. Install sealant backings to support sealants during application and at position necessary to produce cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability:
 - a. Do not leave gaps between ends of sealant backings. Trim for tight fit around obstructions or elements penetrating the joint.
 - b. Do not stretch, twist, puncture, or tear sealant backings.
 - c. Remove absorbent sealant backings that become wet before sealant application and replace with dry sealant backings.
 - d. Install bond breaker tape behind sealants where backings are not used between sealants and back of joints.
- E. Weeps and Vents: Install weeps and vents into joints at the same time sealants are being installed. Locate weeps and vents spaced recommended by sealant manufacturer and the window and curtain wall fabricator and erector. Do not install weeps and vents at outside building corners. Do not install vents at horizontal joints immediately below shelf angles, sills, and through wall flashings.
- F. Sealants:
 - 1. Install sealants by proven techniques resulting in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at same time sealant backings are installed:
 - a. Apply sealants in depth in accordance with manufacturer's recommendations and recommended general proportions and limitations.
 - b. Apply elastomeric sealants, in joints not subject to traffic or abrasion, to a depth equal to 50 percent of the joint width, but not less than 1/4 inch (6 mm) and not more than 1/2 inch (13 mm).
 - c. Apply non-elastomeric sealants to a depth approximately equal to the joint width.
- G. Tooling of Non-Sag Sealants:
 - 1. Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform, beads to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces. Tool exposed surfaces of sealants to the profile shown, or if none is shown, tool slightly concave:
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

- b. Provide a slight wash on horizontal joints where horizontal and vertical surfaces meet.
 - c. Against rough surfaces or in joints of uneven widths avoid the appearance of excess sealant or compound by locating the compound or sealant well back into joint wherever possible.
- H. Installation of Preformed Silicone Sealant System:
 - 1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 - 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch (10 mm). Hold edge of sealant bead 1/4 inch (6 mm) inside masking tape.
 - 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
 - 4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.
- I. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- J. Acoustical Sealant Installation: At sound rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer written recommendations.

3.5 FIELD QUALITY CONTROL

- A. Field Adhesion Testing:
 - 1. Field test exterior wall joint sealant adhesion to joint substrates:
 - a. Extent of testing - test completed and cured sealant joints:
 - 1) Perform ten (10) tests for the first 1,000 feet (300 m) of joint length for each kind of sealant and joint substrate.
 - 2) Perform one (1) test for each 1,000 feet (300 m) of joint length thereafter or one (1) test per each floor per elevation.
 - 2. Test method: Test joint sealants according to Method A, Field Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 - 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer field adhesion hand pull test criteria.
 - 4. Record test results in a field adhesion test log. Include dates when sealants were

installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure original sealant surfaces are clean and new sealant contacts original sealant.

- B. Evaluation of Field Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.6 SITE ENVIRONMENTAL PROCEDURES

- A. Indoor Air Quality: Provide temporary ventilation during work. Coordinate interior application of sealants with interior finishes schedule.

3.7 CLEANING AND PROTECTION

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- B. Protect joint sealants during and after curing from contact with contaminating substances and from damage so sealants are without deterioration or damage at time of Substantial Completion. If, despite protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 07 92 00

SECTION 08 11 13 HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Fabricate and install per the Steel Door Institute (SDI) Guidelines <http://www.steeldoor.org/>

1.2 SECTION INCLUDES

- A. Provide items shown on the drawings and specified, including, but not limited to the following:
 - 1. Standard and fire rated steel doors
 - 2. Steel frames for doors, sidelites, transoms, and windows.
 - 3. Louvers and vision lites in steel doors, if shown or required.

1.3 RELATED WORK

- A. Section 05 40 00: Cold-Formed Metal Framing.
- B. Section 05 50 00: Metal Fabrications.
- C. Section 07 92 00: Joint Sealants.
- D. Section 08 71 00: Door Hardware
- E. Section 08 80 00: Glazing (for non-rated doors)
- F. Section 08 51 13: Aluminum Windows
- G. Section 09 21 16: Gypsum Board Assemblies.
- H. Section 09 24 23: Cement Plastering and Metal Lath.
- I. Section 09 90 00 - Painting and Coatings.

1.4 REFERENCES

- A. American National Standards Institute (ANSI)
 - 1. A115.IG, Installation Guide for Doors and Hardware
 - 2. A224.1, Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors & Frames.
 - 3. A250.8, Recommended Specifications for Standard Steel Doors and Frames. (Formerly SDI-100).
 - 4. A250.11, Recommended Erection Instructions for Steel Frames (Formerly SDI-105).
- B. ASTM International (ASTM)
 - 1. A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
 - 2. A924, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - 3. A1008, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 4. A1011, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 5. C1363 - Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus

6. E283 – Standard Test Method for Determining the rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 7. E413 - Standard Classification for Rating Sound Insulation
- C. Federal Specification (Fed Spec).
1. Fed Spec C578 Bead Fusion Test.
- D. Hollow Metal Manufacturers Association (HMMA)
1. HMMA 802 - Manufacturing of Hollow Metal Doors and Frames.
 2. HMMA 810 - Hollow Metal Doors.
 3. HMMA 830 - Hardware Preparation and Locations for Hollow Metal Doors and Frames.
 4. HMMA 840 - Installation and Storage of Hollow Metal Doors and Frames.
 5. HMMA 850 - Fire Rated Hollow Metal Doors & Frames.
 6. HMMA 890 - Technical Summary of Hollow Metal by HMMA.
- E. National Fire Protection Association (NFPA)
1. 80, Fire Doors and Fire Windows.
 2. 252, Fire Tests of Door Assemblies.
- F. Steel Door Institute – Current Standards
1. Technical Data Series.
- G. Underwriters Laboratories Inc. (UL)
1. Building Materials Directory.
 2. Listing and Labeling.
 3. 10B and 10C, Fire Tests of Door Assemblies.
 4. 1784, Air Leakage Tests of Door Assemblies.
- H. Intertek Testing, Services (Warnock Hersey, Inc. (WHI))
1. Listing and Labeling.

1.4 SUBMITTALS

- A. Product Data:
1. Manufacturer's standard details and catalog data demonstrating compliance with specifications and referenced standards.
 2. Manufacturer's installation instructions.
- B. Shop Drawings:
1. Indicate complete schedule in detail for each steel door and frame using the same reference number for details and openings as those on the Contract Drawings. If any door is not by the steel door manufacturer only the door opening number should be shown along with the type of door (wood, plastic laminate faced, etc.).
 2. Show details of construction, installation, connections, anchors, hardware reinforcement, hardware preparation, louvers, and floor and threshold clearances.
- C. Samples are required from non-Steel Door Institute members:
1. 12 inch x 12 inch sample of a fire-rated and non-rated door, cut from corner of door, showing door construction.
 2. 12 inch x 12 inch sample of each type of door louver specified or required, showing louver construction.

3. 6 inch long sample of a fire-rated, non-rated frame, and each type of glass stop specified or required, showing corner and construction.
- D. Certificates:
 1. Manufacturer's certification that oversized openings are in compliance with specification

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: If other than a manufacturer listed under Paragraph 2.1 is proposed for use on the Project, it shall be a company specializing in the manufacturer of steel doors and frames of the type specified for this Project with a minimum of five (5) years' experience.
- B. All steel doors and frames shall be by a single manufacturer, shop drawings to be submitted with manufacturer's insignia which is being supplied.
- C. Furnish steel doors and frames to meet current ANSI/Steel Door Standards.
- D. ASTM E 330-97, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- E. Comply with ASTM E 283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

1.6 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies:
 1. Fire-Rated Door, Panel, Frame, and Fire Window Construction: Shall conform to ASTM E2074, NFPA 252, or UL 10B, as applicable, and acceptable to the code authorities having jurisdiction.
 2. Fire-Rated Door Construction:
 - a. Notwithstanding any other requirements of this Specification, provide gauge of metal, method of construction, hardware preparation, reinforcement, and placement, glass opening size, and other specifics required to obtain the specified or required label. The label shall contain the fire resistance rating (20 minute, 45 minute, 1 hour, 1-1/2 hour, 3 hour, etc.) and the designation (A, B, C, D, or E). Doors with "B" Label shall be 1-1/2 hour.
 - b. Fire-rated doors used in a stairway enclosure, shall be so constructed so that the maximum transmitted temperature shall not exceed 450 degrees F above ambient temperature at the end of 30 minutes of the Standard Fire Exposure Test and shall be so noted on the label.
 - c. All rated doors shall be factory glazed with a UL Label.
- B. Wind Loads: Provide hollow metal and door hardware assemblies approved by DSA, including anchorage, capable of withstanding wind load design pressures which are calculated for this project by a registered Architect or Engineer and is part of the construction documents per CBC.
- C. Accessibility Requirements: Comply with applicable requirements.
 1. Americans with Disability Act of 1990, as amended.
 2. CBC 2022 California Building Code. CCR Title 24, Part 2, as adopted and amended by DSA.

1.7 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01 31 19 – Project Meetings.

1.8 PROJECT CONDITIONS

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

1.9 COORDINATION

- A. Coordinate the Work of this Section.
- B. Coordinate hardware installation with opening construction. Finish hardware is specified in Section 08 71 00.
- C. Coordinate doors, frames, and windows with glazing specified in Section 08 80 00 Glazing for non fire rated doors.
- D. Coordinate doors and frames with painting specified in Section 09 90 00 Painting and Coating.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store products in accordance with manufacturer's instructions, and as follows:
 - 1. In manufacturer's original, clearly labeled, undamaged containers or wrappers.
 - 2. Containers or wrappers shall list the name of the manufacturer and product.
- B. Deliver materials to allow for minimum storage time at the project site. Coordinate delivery with the scheduled time of installation.
- C. Protect products from moisture, construction traffic, and damage.
 - 1. Store under cover in a clean, dry place, protected from weather and abuse.
 - 2. Store in a manner that will prevent rust or damage.
 - 3. Store doors in a vertical position, spaced with blocking to permit air circulation.
 - 4. Do not use non-vented plastic or canvas shelters.
 - 5. Should containers or wrappers become wet, remove immediately.

1.11 WARRANTY

- A. Warrant the Work specified herein for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship.
- B. Defects shall include, but not be limited to:
 - 1. Use of incorrect materials in opening
 - 2. Incorrect labeled components installed within opening.
 - 3. Noisy, rough or difficult operation
 - 4. Failure to meet specified quality assurance requirements.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Manufacturers listed below whose products meet or exceed the specifications are approved for use on the Project. Other manufacturers must comply with Paragraph 1.5, A, Manufacturer Qualifications, must manufacture equivalent products to those specified and comply with requirements of Section 01 25 00, regarding substitutions to be considered.
1. Curries Company; SSA ABLOY <https://www.curries.com/en/site/curries>
Mason City, IA; (515) 423-1334.
 2. Steelcraft Mfg. Co., Allegion <https://us.allegion.com/en/home.html>
Cincinnati, OH; (513) 745-6400.
 3. Or approved equal

2.2 MATERIALS, GENERAL

- A. Steel requirements, all frames to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel per ASTM-A1008 general requirements. Internal reinforcing may be manufactured of hot rolled pickled and oiled steel per ASTM-A1011. Exterior frames and interior frames where shown on drawings or required in damp, moist, humid, and wet areas, i.e., toilets, locker rooms, showers, etc., to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel and galvanized to 'A-60' minimum coating weight standard per ASTM-A653 and A924, with coating weight of not less than 0.60 ounce per square foot (0.30 ounce per square foot per side).

2.3 FRAME FABRICATION

- A. Minimum Gauges:
1. Interior Openings:
 - a. Less than 4 feet-0 inches in Width: 16 gauge.
 - b. 4 feet-0 inches in Width and greater: 16 gauge.
 2. Exterior Openings:
 - a. Less than 4 feet-0 inches in Width: 16 gauge.
 - b. 4 feet-0 inches in Width and greater: 16 gauge.
- B. Design and Construction:
1. Frames shall be custom made, welded units with integral trim of sizes and shapes shown on approved shop drawings. Hinge jambs that butt adjacent 90 degree walls shall have at least four (4) inch wide frame face to assure the door trim will not strike the wall prior to the door opening at least 90 degrees. Frame profile shall match wall thickness where practical, i.e., 4-3/4 inch at 4 inch CMU, 6-3/4 inch at 6 inch CMU, and 8-3/4 inch at 8 inch CMU. At masonry wall openings, fabricate frames to suite masonry opening with 2 inch head member.
 2. Frames shall be strong and rigid, neat in appearance, square, true and free of defects, warp and buckle. Molded members shall be clean cut, straight and of uniform profile throughout their length.
 3. Jamb depths, trim, profile and backbends shall be as shown on approved shop drawings.
 4. Corner joints, including face and inside corners, shall have contact edges closed tight, with trim faces mitered and continuously welded, and stops butted. The use of gussets shall not be permitted. Face of frame shall be ground smooth. Knockdown (KD) frames are not permitted.
 5. Minimum depth of stops shall be 5/8 inch, except at fire windows where minimum depth of stops shall be 3/4 inch.
 6. Frames for multiple openings shall have mullion and rail members which are closed tubular shapes having no visible seams or joints. Joints between faces of abutting members shall be securely welded and finished smooth. Mullions shall be key locked removable type. Keys shall be master keyed to Owner's Best system.

7. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inch and wider with mortise/butt type hinges only at top hinge location to deter against hinge reinforcement sag.
8. Continuous Hinge Reinforcement: Provide welded continuous 12 gage strap for continuous hinges specified in hardware sets in Division 8 Openings.
9. Provide countersunk flat or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops; provide security head screws at exterior locations.
10. Provide A60 Galvannealed coating at frames in restrooms and locker rooms with showers/Jacuzzi, clean areas such as kitchen rooms.
11. Electrical Knock Out Boxes: Factory weld 18 gage electrical knock out boxes to frame for electrical hardware preps; included but not limited to electric thru wire hinges, electrical raceways, door position switches, electric strikes, jamb mount card readers, and magnetic locks as noted in door hardware sets in Division 8 Openings.
 - a. Electrical knock out boxes are required at door position switches, electric strikes, card readers, and middle hinge locations Openings.
 - b. Provide electrical knock out boxes with 3/4-inch knockouts.
 - c. Conduit to be coordinated and installed in field from middle hinge box and strike box to door position box.
 - d. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 8 Openings.
 - e. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
 - f. Provide field installed conduit per Division 28 section for standardized plug connectors to accommodate up to twelve (12) wires as required for electrified door hardware specified in hardware sets in Division 8 Openings. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Wire nut connections are not acceptable.
12. Hardware Reinforcements:
 - a. Frames shall be mortised, reinforced, drilled and tapped at factory for fully template mortised hardware in accordance with approved hardware schedule and templates provided by Section 08 71 00 Door Hardware. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates only.
 - b. Minimum thickness of hardware reinforcing plates shall be as follows:
 - 1) Hinge and pivot reinforcements (1-1/4 inch x 10 inch minimum size): 7 gauge.
 - 2) Strike reinforcements: 12 gauge stiffeners.
 - 3) Flush bolt reinforcements: 12 gauge.
 - 4) Closer reinforcements: 14 gauge.
 - 5) Reinforcements for surface-mounted hardware, hold-open arms, surface panic devices: 14 gauge.
13. Floor Anchors: Minimum 14 gauge, securely welded inside each jamb, with holes for floor anchorage.
14. Jamb Anchors:
 - a. Frames for installation in wood or metal stud partitions shall be provided with steel anchors of suitable approved design, not less than 16 gauge thickness, securely welded inside each jamb as follows:
 - 1) Frames up to 7 feet-6 inch height - Four (4) anchors
 - 2) Frames 7 feet-6 inch to 8 feet-0 inch height - Five (5) anchors
 - 3) Frames over 8 feet-0 inch height - Four (4) anchors plus one (1) additional for each 2 feet or fraction thereof over 8 feet-0 inches.
 - b. Frames to be anchored to previously placed concrete, masonry or structural steel shall be provided with anchors of suitable design as shown on approved shop drawings.

15. Dust Cover Boxes: Shall be of not less than 26 gauge steel and shall be provided at all mortised hardware items. Eight (8) inch CMU walls with face brick shall have dual offset jamb anchors.
 16. Steel Spreader: Shall be provided on all frames, temporarily attached to bottoms of both jambs for bracing during shipping and handling.
 17. Loose Glazing Stops: Shall be of cold rolled steel, not less than 20 gauge, butted at corner joints and secured to the frame with countersunk cadmium or zinc-plated screws. Loose stops at exterior frames shall be placed on the interior side of the frames.
 18. At sound rated door openings and at masonry openings, coat inside of frame profile with corrosion resistant coating to minimum thickness of 1/16 inch.
- C. Frame Color: Field painted under Section 09 90 00 Painting and Coating to match face of door. Provide factory baked-on enamel primer finish and coordinate field painting requirements for compatible touch-up primer and finish coats.

2.4 DOOR FABRICATION

- A. Minimum Gauges:
1. Interior Doors: 0.047 inch or 18 gauge (16 gauge for high frequency doors: Classrooms).
 2. Exterior Doors: 0.059 inch or 16 gauge (14 gauge for windstorm rated doors: Building entry doors).
- B. Design and Construction:
1. Types: Doors shall be custom fabricated, of types and sizes shown on approved shop drawings, and shall be seamless face construction with no visible seams or joints on vertical edges with fully welded seams free from blemishes and defects. Thickness: Shall be 1-3/4 inch, unless specifically noted or shown otherwise.
 2. Exterior Doors: Provide doors with 22 gage steel z-channels placed at 6 inches apart with foamed in place polyurethane core, with a thermal insulation calculated R factor of 11.01 per ASTM C518 Standards.
 3. Fabrication:
 - a. Doors shall be strong, rigid and neat in appearance, free from warpage and buckle.
 - b. Corner bends shall be true and straight and of minimum radius for gage of metal used.
 - c. Provide stiffeners with polystyrene core spaced maximum six (6) inches on center and extending full height of door.
 - d. Fill interior with noncombustible fiberglass insulation. Use mineral board filler as required for labeled doors.
 - 1) Faces shall be joined at vertical edges of door by a continuous weld extending full height of door. Welds shall be ground, filled and dressed smooth to provide a smooth flush surface.
 - e. 14-Gauge face skins bonded to core
 - f. Top and bottom edges of doors shall be closed with a continuous recessed steel channel not less than 1 gauge, extending full width of door and spot weld to both faces. Exterior doors shall have an additional flush closing channel at top and bottom edges. Openings shall be provided in the bottom closure channel at top and bottom edges. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.
 - g. Continuous Hinge Reinforcement: Provide welded continuous 12 gage strap for continuous hinges specified in hardware sets in Division 8 Openings
 - h. Doors within in wet or humid areas shall have a top cap and solid foam interior core to prevent internal moisture accumulation and galvannealed.
 - i. Edge profile shall be provided on both vertical edges of door as follows:
 - 1) Single-Acting Swing Doors: Beveled 1/8 inch in 2 inches.
 - k. Hardware Reinforcements:

- 1) Doors shall be mortised, reinforced, drilled and tapped at factory for fully template hardware, in accordance with the approved hardware schedule and templates provided by Section 08 71 00 Door Hardware. Where surface-mounted hardware is to be applied, doors shall have reinforcing plates only.
 - 2) Minimum gauges for hardware reinforcing plates shall be as follows:
 - a) Hinge & pivot reinforcements: 7 gauge
 - b) Reinforcements for lock face, flush bolts, concealed holders.
 4. Glass Moldings and Stops: Loose stops shall be not less than 20 gauge steel, with butt corner joints, secured to frame opening by countersunk screws. Snap-on attachments will not be acceptable.
 5. Louvers: Shall be inverted "V" blade, sight proof type, unless noted otherwise.
 6. Edge Clearances:
 - j. Between Door and Frame at Head and Jambs: 1/8 inch
 - k. At Door Sills with No Threshold: 5/8 inch to 3/4 inch above finished floor
 - l. At Door Sills with Threshold: As required to suit threshold
 7. 14-Gauge Closer Reinforcement Channel
- C. Finish:
1. Provide factory baked-on enamel primer finish and coordinate field painting requirements for compatible touch-up primer and finish coats.
 - a. Clean surfaces free of mill scale, rust, oil, grease, dirt and other foreign matter.
 2. Field painted under Section 09 90 00 Paintings and Coating.
 - a. Field coordinate with factory finishes for touch paint and colors.
- D. Sound Rated Door: STC of 32, measured in accordance with ASTM E413.

2.5 LABELED DOORS AND FRAMES

- A. Labeled doors and frames shall be provided for openings requiring fire protection ratings as scheduled and to comply with NFPA 80. Such doors and frames shall be constructed as tested and approved by UL, WHI, or other nationally recognized testing agency having a factory inspection service and approved by code authorities having jurisdiction and shall bear the appropriate permanent label.
- B. If any door or frame scheduled to be fire-rated cannot qualify for appropriate labeling because of its size, design, hardware or other reason; the Architect shall be so advised before fabrication work on that item is started. Indicate and highlight on shop drawing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Separate dissimilar metals. Protect against galvanic action.
- B. Frames:
1. Anchorage and Connections: Secure to adjacent construction. Where practical, interior door frames shall be flush with the pull side wall to minimize or eliminate the reveal and allow full 180 degree door swing.
 2. Install frames in accordance with manufacturer's instructions and install labeled frames in accordance with NFPA 80.
 3. Frame Spreader Bars: Leave intact until frames are set perfectly square and plumb and anchors are securely attached.
 4. Remove hardware, with the exception of prime-coated items, tag box, and reinstall after

finish paint Work is completed. Do not remove or paint over labels on labeled frames.

5. Factory baked-on enamel primer finish and coordinate field painting requirements for compatible touch-up primer and finish coats. See 09 90 00.

C. Doors:

1. Install hardware in accordance with hardware manufacturer's templates and instructions.
2. Install doors in accordance with manufacturer's instructions and install labeled doors in accordance with NFPA 80.
3. Adjust operable parts for correct function.
4. Remove hardware, with the exception of prime-coated items, tag, box, and reinstall after finish paint Work is completed. Do not remove or paint over labels on labeled doors.

3.2 ADJUST AND CLEAN

- A. Adjust doors for proper operation, free from binding or other defects.
- B. Clean and restore soiled surfaces.
- C. Remove scraps and debris, and leave site in clean condition.

END OF SECTION 08 11 13

SECTION 08 31 13 ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes access doors in gypsum board, masonry partitions, and plaster/stucco soffits, where shown or required.
- B. Related Sections:
 - 1. Section 05 50 00: Metal Fabrications.
 - 2. Section 06 83 16: Fiberglass Reinforced Paneling.
 - 3. Section 08 11 13: Hollow Metal Doors and Frames.
 - 4. Section 09 30 00: Tile.
 - 5. Section 09 50 00: Acoustical Ceiling Panels.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's literature, including schedules, charts, installation instructions, and illustrations to indicate the performance, fabrication, procedures, product variations, and accessories.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers listed whose products meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of five (5) years' experience manufacturing access doors meeting or exceeding the specifications and comply with Division 01 requirements regarding substitutions in order to be considered:
 - 1. J. L. Industries, Commerce, CA (basis of design for rated floors).
 - 2. Karp Associates, Inc., Melville, NY (basis of design).
 - 3. The Bilco Company, New Haven, CT.
 - 4. Babcock-Davis, San Lorenzo, CA.
 - 5. Larsen's Manufacturing Co., Minneapolis, MN.
 - 6. Milcor, Grand Rapids, MI.
 - 7. Approved equal.

2.2 PRODUCTS

- A. Standard type flush steel access door for plaster/stucco soffit construction:
 - 1. Size: As shown on the Drawings.
 - 2. Hinges: Concealed continuous piano type hinges.
 - 3. Finish: Phosphate dipped and prime coated for field painting per Section 09 90 00: Painting.
 - 4. Frames: 16-gauge galvanized steel with 22-gauge galvanized plaster casing bead.
 - 5. Doors: 14-gauge galvanized steel.

6. Lock: Flush screwdriver operated cam.
- B. Fire Rated, Two-Hour, Floor Access Door - Flush steel door for wallboard construction:
1. Listing: UL listed, compliant to NFPA 288.
 2. Size: As shown on the Drawings.
 3. Hinges: Heavy-duty Type 316 stainless steel butt hinge.
 4. Finish: 20-gauge galvanized metal with gray primer on exterior frame; field painting per Section 09 90 00: Painting.
 5. Frames: Extruded aluminum.
 6. Doors: Single leaf.
 7. Lock: Knurled knob/key operated latch bolt.
 8. Insulation: Two-inch (2") thick fire rated mineral fiber
- C. Non-Rated Floor Access Door:
1. Listing: Not required.
 2. Size: As shown on the Drawings.
 3. Hinges: Heavy-duty Type 316 stainless steel butt hinge.
 4. Finish: 20-Gauge galvanized finish with gray primer on exterior frame; field painting per Section 09 90 00: Painting.
 5. Frames: 20-Gauge galvanized steel. Anchor to wood floor.
 6. Doors: Single leaf.
 7. Lock: Knurled knob/key operated latch bolt.
 8. Hold open door.
- D. Ceiling Access Door:
1. Listing: Not required.
 2. Size: As shown on the Drawings.
 3. Hinges: Heavy-duty Type 316 stainless steel butt hinge.
 4. Finish: 20-gauge galvanized finish with gray primer on exterior frame; field painting per Section 09 90 00: Painting.
 5. Frames: Extruded aluminum. Anchor to wood floor.
 6. Doors: Single leaf.
 7. Lock: Knurled knob/key operated latch bolt.
 8. Hold open door.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Locate and provide access doors in walls (and floors) to construct the wall as indicated on Drawings and provide access doors and panels to fit the wall condition. Maintain designated wall types as indicated on Drawings.

3.2 LOCATIONS

- A. Provide where required by code and where needed to service and maintain equipment.
- B. If not shown on the Drawings, consult the Architect before locating in finished spaces.

END OF SECTION 08 31 13

SECTION 08 33 23 OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Motor operated stainless steel door with trim and accessories (use in food areas).
 - 2. Electric wiring from disconnect(s) to motor operator.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors:
 - 1. Capable of withstanding the design wind loads:
 - a. Design wind load: As indicated on Drawings.
 - b. Testing: According to ASTM E330.
 - c. Deflection limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
- B. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE 7.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 - 2. Manufacturer's installation instructions.
 - 3. Manufacturer's operation and maintenance data.
- B. Shop Drawings: Indicating opening sizes, details of slat curtain, track and hardware, attachments, related and adjacent work, materials, and finishes.
- C. Samples: 12-inch by 12-inch sample of slats with specified finish for each type door.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing coiling doors with minimum five (5) years' experience and approved by manufacturer.
- B. Contractor shall have the sole responsibility for entire coiling door assembly and associated work shown or required for complete system.
- C. Pre-installation conference is to be conducted onsite.

1.6 WARRANTY

- A. Warrant the work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance resulting from both defective or nonconforming materials and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS, GENERAL

- A. Source Limitations:
 - 1. Obtain overhead coiling doors from single source from single manufacturer: Obtain operators and controls from overhead coiling door manufacturer.

2.2 DOOR ASSEMBLY AND SIZE (AS INDICATED ON DRAWINGS)

- A. Insulated Service Door:
 - 1. Overhead coiling door formed with curtain of interlocking metal slats:
 - a. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following (substitution form required for manufacturers other than listed as basis of design):
 - 1) Cookson Company (basis of design).
 - 2) ACME Rolling Doors.
 - 3) Clopay Building Products.
 - 4) Cornell Iron Works, Inc.
 - 5) McKeon Rolling Steel Door Company, Inc.
 - 6) Overhead Door Corporation.
 - 7) Raynor.
 - 8) Approved equal.
- B. Operation Cycles:
 - 1. Door components and operators capable of operating for not less than 50,000 cycles:
 - a. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position:
 - 1) Include tamperproof cycle counter.
- C. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. (0.406 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E283 or ANSI/DASMA 105.
- D. STC Rating: 26.
- E. Curtain R-Value: 4.5 deg F x h x sq. ft./Btu (0.792 K x sq. m/W).
- F. Door Curtain Material: Stainless steel.
- G. Door Curtain Slats:
 - 1. Flat profile slats of 2-1/4 inch (83-mm) center-to-center height:
 - a. Insulated-slat interior facing: Metal.
 - b. Gasket seal: Manufacturer's standard continuous gaskets between slats.
- H. Bottom Bar: Two angles, each not less than 1-1/2 inch by 1-1/2 inch by 1/8 inch (38 mm x 38 mm x 3 mm); fabricated from aluminum extrusions and finished to match door.
- I. Curtain Jamb Guides: Steel with exposed finish matching curtain slats.

- J. Hood:
 - 1. Finish: Stainless steel to match curtain.
 - 2. Shape: Square.
 - 3. Mounting: As shown on Drawings.
- K. Locking Devices:
 - 1. Equip door with locking device assembly and chain lock keeper:
 - a. Locking device assembly: Cremone type, both jamb sides locking bars, operable from inside and outside with cylinders.
- L. Electric Door Operator:
 - 1. Usage classification: Light duty, up to ten (10) cycles per hour.
 - 2. Operator location: Front of hood.
 - 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at eight feet (2.44 m) or lower.
 - 4. Motor exposure: Interior.
 - 5. Emergency manual operation: Crank type.
 - 6. Obstruction-detection device: Automatic photoelectric sensor.
 - 7. Sensor edge bulb color: As selected by Architect from manufacturer's full range.
 - 8. Control station(s): Interior mounted.
- M. Curtain Accessories:
 - 1. Equip door with weatherseals:
 - a. Finish: Stainless steel, type 304 #4 finish.
 - b. CycleShield™ (stock colors): Powder coating system with low coefficient of friction wear-resistance to include a galvanized base coat consistent with ASTM A653, Zirconium treated and bonderized for prime coat adhesion, with a tan baked-on polyester powder coat rust inhibiting paint with a minimum two mils (0.0508 mm) cured film thickness.
 - c. CycleShield (RAL color selected by Architect): Powder coating system with low coefficient of friction wear-resistance to include a galvanized base coat consistent with ASTM A653, Zirconium treated and bonderized for prime coat adhesion, with RAL powder coat color as selected by Architect baked-on polyester powder coat rust inhibiting paint with a minimum two mils (0.0508 mm) cured film thickness.

2.3 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains:
 - 1. Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
 - a. Steel door curtain slats: ASTM B209 sheet or ASTM B221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch (1.27 mm); and as required.
 - b. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of

75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.

- B. Curtain Jamb Guides:
 - 1. Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks:
 - a. Thresholds: Equip pass doors with integral thresholds that comply with egress and accessibility requirements of authorities having jurisdiction.

2.5 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

2.6 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.
- B. Locking Device Assembly:
 - 1. Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks:
 - a. Lock cylinders: Cylinders specified in Section 08 71 00: Door Hardware and keyed to building keying system.
 - b. Keys: Three (3) for each cylinder.
- C. Chain Lock Keeper: Suitable for padlock.
- D. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.7 CURTAIN ACCESSORIES

- A. Weatherseals for Exterior Doors:
 - 1. Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated:
 - a. At door head, use 1/8-inch (3 mm) thick, replaceable, continuous-sheet baffle secured to inside of hood or field installed on the header.
 - b. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch (3 mm) thick seals of flexible vinyl, rubber, or neoprene nylon brushes.

2.8 ELECTRIC DOOR OPERATORS

- A. General:
 - 1. Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation cycles requirement specified, with electric motor and factory prewired motor controls, starter, gear-reduction unit, solenoid-

- operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation:
- a. Basis of design product: Chamberlain/The Chamberlain Group, Inc.
 - b. Alternate complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s) - Indicated for Each Door:
1. Top-of-hood mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
- D. Motors:
1. Reversible-type motor with controller disconnect switch for motor exposure indicated.
 - a. Electrical characteristics:
 - 1) Phase: Polyphase.
 - 2) Hertz: 60.
 - b. Motor size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than eight inches per second (203 mm/s) and not more than 12 inches per second (305 mm/s), without exceeding nameplate ratings or service factor.
 - c. Operating controls, controllers, disconnect switches, wiring devices, and wiring: Manufacturer's standard unless otherwise indicated. Field coordinate prior to install.
 - d. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction Detection Devices:
1. External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel:
 - a. Photoelectric sensor:
 - 1) Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction:
 - a) Self-monitoring type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.
- G. Control Station:
1. Three (3) button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained or constant-pressure push-button control labeled "Close":
 - a. Interior-mounted units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 - b. Exterior-mounted units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
 - c. Emergency manual operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for

door operation does not exceed 25 lbf (111 N) 30 lbf (133 N).

- H. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- I. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrate areas and conditions, with installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Power-Operated Doors: Install according to UL 325.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service:
 - 1. Perform installation and startup checks according to manufacturer's written instructions.
 - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
 - 3. Test door closing when activated by detector or alarm-connected fire-release system. Reset door closing mechanism after successful test.
- B. Adjusting:
 - 1. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion:
 - a. Adjust exterior doors and components to be weather-resistant.
 - 2. Lubricate bearings and sliding parts as recommended by manufacturer.
 - 3. Adjust seals to provide tight fit around entire perimeter.

3.4 MAINTENANCE SERVICE

- A. Initial Maintenance Service:
 - 1. Beginning at Substantial Completion, maintenance service shall include six (6) months' full maintenance by skilled employees of coiling-door installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies:
 - a. Perform maintenance, including emergency callback service, during normal working hours.
 - b. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 08 33 23

SECTION 08 51 13 ALUMINUM WINDOWS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Section 07 92 00: Joint Sealants
- B. Section 08 80 00: Glazing
- C. Section 09 24 23: Cement Plaster & Metal Lath
- D. Section 09 21 16: Gypsum Board

1.2 REFERENCES

- A. American Architectural Manufacturers Association (AAMA)
- B. American Society for Testing and Materials (ASTM)
- C. AAMA 101 - Voluntary Specifications for Aluminum Prime Windows and Sliding Glass Door.
- D. ASTM B137 - Standard Test Method for Measurement of Coating Mass Per Unit Area on Anodically Coated Aluminum.
- E. ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape and Tube.
- F. ASTM B680 - Standard Test Method for Seal Quality of Anodic Coatings on Aluminum by Acid Disolution.
- G. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- H. ASTM E283 - Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors.
- I. ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- H. ASTM E331 - Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- I. ASTM E344 - Terminology Relating to Thermometry and Hydrometry.
- J. ASTM E413 - Classification for Rating Sound Insulation.
- K. ASTM E547 - Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential.
- L. ASTM E987 - Standard Test Methods for Deglazing Force of Fenestration Products.
- M. ASTM E 1105-15 – Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows.
- N. AAMA 502-12 – Voluntary Specifications for Field Testing of Newly Installed Fenestration Products
- O. CCR - California Code of Regulations, Title 24, Part 6, 116.
- P. CED - California Energy Commission.
- Q. FS-TT-S-00230C-Caulking.

- R. NFRC - National Fenestration Rating Council.
- S. SIGMA - Sealed Insulating Glass Manufacturers Association.
- T. AA – Aluminum Association
- U. CAWM -California Association of window Manufacturers

1.3 SUBMITTALS

- A. Product Data: Technical data for each type of product indicated including construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum framed systems.
- B. Shop Drawings: Submit aluminum storefront framing and entrances shop drawings including plans, elevations, sections, full size details, and attachments to other work.
 - a. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
- C. Manufacturers installation instructions.
- D. Include wall opening and component dimensions; wall opening tolerances required; anchorage and fasteners; affected related work; installation requirements.
- E. Submit samples.
- F. Submit one full size mock-up illustrating window frame sections, corner section, mullion section, and panning.
- G. Submit two samples of operating hardware.
- H. Submit manufacturer's certificate that window units meet or exceed specified requirements.
- I. Maintenance Data: For aluminum framed systems to include in maintenance manuals

1.4 QUALITY ASSURANCE

- A. Qualifications: Fabrication shall be by a Window Manufacturer who can furnish evidence to the School District that they are, and have been for not less than ten (10) consecutive years, regularly engaged in the manufacture of aluminum replacement window units for California public schools of similar in design and performance to those specified for this Project, together with a current list of completed school projects in the local area.
- B. Installation Contractors Certification: Before commencing with the installation of the windows the installation contractor shall provide evidence of certification in the training of the products by the manufacturer or his authorized representatives.
- C. Mock Up: Installation Contractor shall perform a mock up window rehabilitation on a typical window opening selected by the Owner and/or their representative for review at pre-installation meeting for inspection and optional testing. Prior to commencing with the work on this project, Mock ups to be completed in a satisfactory manner to meet project specifications for materials, workmanship and performance and provide a basis for an acceptable level of quality and workmanship and set the criterion for accepting or rejecting all items of work in this contract.
- D. Pre-installation project meeting. Manufacturer or his authorized representative to conduct meeting with the installation contractor and others as required to review the mock up and installation of the first windows to serve as a basis of proper method in accordance with the manufacturers recommended instruction.

- E. Identification: The sill of each window shall have a permanently affixed metal label identifying the manufacturer.
- F. Labeling on window certifying that certification and labeling of fenestration product U-factors, solar heat gain coefficients and air leakage of California Building Code (CBC), California Code of Regulations (CCR) Title 24 Article 1 Energy Building Regulations Section 10-111 have been met.
- G. Solar Heat Gain Coefficient (SHGC): The SHGC shall be rated in accordance with the National Fenestration Rating Council's (NFRC) 200 Rating Procedure or in accordance with the default table method approved by the California Energy Commission (CEC). Provide certified results.
- H. Single Source Responsibility: Obtain entrances, storefronts, ribbon walls, window walls, curtain walls, window systems, and finish through one source from a single manufacturer.
- I. Provide test reports from AAMA accredited laboratories certifying the performances as specified in 1.5.

1.5 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: Each assembly tested by a recognized testing laboratory or agency in accordance with specified test methods. Air, water and structural test unit sized and configuration shall conform to requirements set forth in ANSI/AAMA 101-93
 - A.
 - 1. Conformance to AAMA 101/I.S. 2-97.
 - a. Air Infiltration: Test unit in accordance with ASTM E 283-04 at a static air pressure difference of 6.24 psf. Air infiltration shall not exceed .02 cfm per square foot.
 - b. Water Resistance: Test unit in accordance with ASTM E 547 & 331-00 at a static air pressure difference of 12.0 psf. No water leakage.
 - c. Uniform Load Structural: Tested per ASTM E 330-02 and ASTM 547 at a static air pressure difference of 97.5 psf.
 - d. Uniform Load Deflection: Tested per ASTM E 330-02 65 psf.
 - e. Component testing: Test unit in accordance with procedures described in AAMA 101/I.S. 2-97.
 - f. Forced Entry Resistance: Conform to ASTM F 588-07 Grade 40: No Entry.
 - g. Condensation Resistance Factor (CRF): Test unit in accordance with AAMA 1503.1-88, the condensation resistance factor shall not be less than 56 for the frame, 64 for the glass.
 - h. Thermal Transmittance Test: Test unit in accordance with AAMA 1503.1-88 (U-Value) not more than .56 BTU/hr/sf/°F.
 - i. Thermal Movements: Allow thermal movement resulting from the following maximum change (range) in ambient temperature.
 - (i) 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 - B. Test each type and size of required window unit through a recognized testing laboratory or agency, in accordance with ASTM E330 for structural performance, with ASTM E283 for air infiltration and with both ASTM E331 and ASTM E547 for water penetration. Provide certified test results.
 - H. Sound Transmission Loss: The window when tested in accordance with ASTM E90 and ASTM E413 will have a calculated STC not less than 32 when the sash is glazed with 1/4 inch laminated glass.

- I. Operating Force: Operating sash once started in motion will not require more than 35 lbs. operating force to keep the sash in motion, in either direction on an NFRC sample size window of 47" x 59". Reference NFRC 400-2010.
- J. Deglazing Test: Sash when tested in accordance with ASTM E987 will have no disengagement of the sash rails from the glass when a load of 70 lbs. is applied to the horizontal rails and 50 lbs. to the vertical rails.
- K. Aluminum Anodic Finish and Hardness Test: Submit three 12 inch long pieces of anodically finished exterior sill, meeting rail and mullion cover. Each sample will be tested for coating thickness, coating weight, stain resistance and hardness. The performance will meet these minimums:
 - 1. A ASTM E 244 (Anodized Coating Thickness) .7 mils Architectural Class 1.
 - 2. A ASTM B 137 (Anodized Coating Density) 38g/in³.
 - 3. A ASTM B 680-89 (Anodic Seal Integrity) No observable stain.
 - 4. A Rockwell Tester (Hardness) Gauge reading of 12 on Webster dial gauge.
- L. Certified Test Reports for windows will be required.
- M. Provide structural performance and air and water penetration performance requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and protect window units and all related components and accessories from damage by weather, dirt, dust and debris until installation. Provide adequate protection, wrapping or strippable coating to protect pre-finished aluminum and glass surfaces.

1.7 WARRANTY

- A. Warranty: Written warranty signed by Manufacturer, Contractor, and Installer in which manufacturer agrees to repair or replace components of aluminum framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1) Failures include, but are not limited to, the following:
 - a) Structural failures including, but not limited to, excessive deflection.
 - b) Noise or vibration caused by thermal movements.
 - c) Water leakage through fixed glazing and framing areas.
 - d) Failure of operating components.
 - 2) Warranty Period: Two years warranty against failure and/or deterioration of metals due to manufacturing process.
 - 3) Provide Manufacturers warranty on finish

1.8 MANUFACTURER AND INSTALLER FOLLOW UP

- A. Manufacturer shall designate the factory certified representative and installer as responsible to be on call for a period of five (5) years following the date of project closeout. During such time, all calls shall be responded to within seventy two (72) business hours of notification by the District; on call shall include scheduling any repairs required for the system as well as training and assistance to District staff as needed.
- B. Following the five-year period and for the remainder of the ten-year warranty period, the manufacturer shall be on call to correct all defects in manufacture. If such corrections involve need for the designated factory-certified installer, then installer shall be included as well.

1.9 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with applicable requirements.
 - a) Americans with Disabilities Act of 1990, as amended.
 - 1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design
 - b) CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA).
 - 1) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Arcadia Inc <http://www.arcadiainc.com> (Basis of Design)
 - a. Basis of Design: C3500 Series Double Hung (Concessions windows only)
- B. Oldcastle Building Envelope (Vistawall) <http://www.oldcastlebe.com/>
- C. Winco <http://www.wincowindow.com>
- D. Graham Architectural Products <http://grahamwindows.com/>
- E. CRL US Aluminum (Basis of Design for Ticket Booth Only)
 - a. CLR Ticker Window With Speak-Thru and Swing-Away Cover Plate #SCW102C*
 - b. Material: Stainless Steel
- F. Or Architect approved equal

2.2 SYSTEM DESCRIPTION

General: In addition to requirements shown or specified, comply with:

Applicable provisions of AAMA Windows and Sliding Glass Doors Manual for design, materials, fabrication and installation of component parts.

2.5 MATERIALS

- A. Extruded aluminum profiles 6063-T6 alloy and temper (ASTM B221 G.S. 10A-T5).
- B. All framing members .062 minimum wall thickness.
- C. Back glazing two-sided adhesive, 15 lbs./ft.³ density, polyethylene tape. Glazing wedges EPDM or Santoprene.
- D. Thermal barrier material poured in-place two part polyurethane.
- E. Frame components shall be mortised and tightly joined using two (2) #8 stainless steel screws per joint.
- F. Sash components shall be coped and secured with a minimum of two (2) #8 stainless steel screws per joint.
- G. Glazing, glazing gaskets, spacers and setting blocks, per manufacturer's requirements

2.6 WEATHER-STRIPPING

- A. Windows shall be fully double weather-stripped at all sash perimeters; at sill, meeting rail, head and jambs with woven pile seal. All weather-stripping to be silicone treated. UV stabilized polypropylene pile with an integral polypropylene fin-type seal. This is to be bonded to a non-shrinking backing. The entire window unit shall be constructed in a manner that will allow easy replacement of any hardware or weather-stripping. All weather-stripping in the sash shall be concealed to prevent accumulation of foreign

matter or matting through cleaning, operating or handling, which would reduce the effectiveness or life of the weather-stripping. Weather-stripping shall be secured to prevent movement or loss when removing sash for cleaning or glass repair.

2.7 FINISH

- A. Finish: Clear Anodized Aluminum, NAAMM AA-M12-C22-A41. Class I
All areas of aluminum windows and components with electrolytically deposited color thickness equal to 215-R1 Alcoa 7 mil thickness. Finish shall meet ASTM E 244 for .7 mils Architectural Class 1, ASTM B 137 (Anodic Coating density) 38g/in³., ASTM B680 (Anodic Seal Integrity) no observable stain.
- B. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

2.8 GLASS AND GLAZING MATERIALS

- A. Glass: All glass shall be 1" thick Glazing per Section 08 80 00
- B. Glazing, glazing gaskets, spacers and setting blocks, per manufacturer's requirements.

2.9 OPERATION

- A. Where operation is indicated on drawings, if required, furnish overhead block and tackle type balances for all bottom operable sash and excluded on all upper stationary sash. Where balances are required, they shall work in conjunction with the pin-lock operating system. All sash shall be side load, and with the use of custodial tools to remove security hardware, easily removable from the inside for cleaning or repairs.
- B. Stainless steel hinges and latches. Windows to automatically lock when closed.
- C. Provide poles, wands, and other operating items such that latch is accessible.
- D. Accessibility:
 - i. Operable parts shall comply with 11B-309
 - ii. Clearances & reach ranges for operable parts shall comply with 11B-309
 - iii. Operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds maximum per 11B-309.4.

2.10 EXTERIOR PANNING TRIM

- A. All exterior panning shall be extruded 6063-T6 aluminum with a minimum wall thickness of .062" with configuration and dimensions as detailed. When installed the panning shall cover all existing exterior window framing, blocking, mullions, and trim. Aluminum sections shall be one piece, designed to interlock into window frame for the full length of jamb, head, and sill sections, in a manner that will allow back sealing of the entire perimeter to provide a completely weather tight connection. Where the head and sill butts up to the jambs a stainless steel alignment clip shall be used and back sealed. Exposed screws and rivets will not be accepted on exterior panning and covers. Where existing windows protrude away from the building panning shall cover and wrap back to the stucco, brick or building fascia in a manner that covers all wood or metal. Angle panning shall be extruded 6063-T6 aluminum, which will interlock onto the panning and have a flange to allow caulking of the seam. Mitered panning corners, or receptor type panning requiring an exposed sealant joint at the exterior, between the window frame and panning joint will not be accepted.

2.11 INTERIOR TRIM

- A. All interior trim shall be extruded 6063-T6 aluminum with a minimum wall thickness of .50". Mounting clips and fasteners for trim shall be concealed so no exposed screws or rivets are visible.

2.12 MULLION AND TRANSOMS

- A. Where two or more frames are joined together, horizontally or vertically, the connector design shall be continuously interlocked onto the inner and outer edges of the frame and shall incorporate a port for weather sealing at the exterior. There shall be no exposed screws on either the interior or the exterior. The mullions and transoms must be capable of withstanding the project design wind load on the total area without deflecting more than 1/175th of the span.

2.13 HARDWARE

- A. All assembly and installation fasteners and screws incorporated in the window units, exterior panning and interior trim sash be non-magnetic, stainless steel. All hardware parts shall be of aluminum, stainless steel, nylon, or other non-corrosive materials compatible with aluminum. NOTE: Wrought metal or plastic parts will not be acceptable.
- B. Safety Blocks for Upper sash shall be per Manufacturer for and Installed at each frame jamb with tamperproof screws to fix upper sash, yet sash to remain easily removable once blocks are removed.
- C. Sash Restrictor/Limit Custodial Hardware shall be per Manufacturer for and Installed at each left jamb at meeting rail location to be accessed with custodial security tool to fix or limit sash operation.
- D. Balances: Where lower sash are indicated to be operable on drawings, and when required furnish per Manufacturer for overhead block and tackle balances, sized per specific window size, into interior head frame track and covered with Manufacturer Part as required for balance cover.
- E. Stainless steel hinges and latches. Windows to automatically lock when closed.
- F. Provide poles, wands, and other operating items such that latch is accessible.

2.14 SEALANT MATERIALS

- A. Sealant and Backing Material: As specified in Section 07 92 00.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify wall and window openings are ready to receive work of this Section. Verify that all related work such as all required demolition, new blocking, flashing and weather-proof membranes are complete per the details and dimensions shown on the appropriate shop drawings and Architectural Drawings and Specifications.
- B. Beginning of installation means acceptance of existing conditions.
- C. Field testing per AAMA 502-02 based on ASTM E 1105.
- D. Perform test on mock-up or first portion installed in addition to final testing of 10 percent of all windows or five windows, whichever is greater.
 - 1) If any one of the ten percent fail, additional testing shall be paid for by the contractor and a completely new set of windows will be re-tested.

- E. The District is to employ an independent testing company specializing in window testing. Test windows at 2/3 of manufacturer's design test pressure or 8 PSF whichever is greater

3.2 INSTALLATION

- A. Install window frames, glass and glazing and hardware in accordance with manufacturer's instructions and any related project shop drawings.
- B. Remove all sash prior to and during installation. Assemble any mullions and panning system to window frames and hardware in accordance with manufacturer's instructions and any related project shop drawings.
- C. Use anchorage devices to securely attach frame to structure. Anchors should be not less than #10 non-magnetic, stainless steel screws. The length of the installation screws shall allow a minimum of one (1) inch (2.54 cm) to penetrate through any liners or blocking into the existing window frame or new sub-framing. Anchors shall be installed through both the interior and exterior frames. Anchoring screws will be countersunk into the main frames to avoid any interference with sash, balances or hardware. Anchoring through the tubular interior or exterior sill frames shall not be acceptable. Anchors must be adequate to handle thermal and building movement, and specified uniform load requirements.
- D. Align window frame plumb and level, free of warp or twist. Maintain dimensional tolerances, aligning with adjacent work. Plumb and align window faces in a single plane for each wall plane. Erect windows and accessories square, true and plumb using shims and anchors to maintain a permanent position.
- E. Insulate shim spaces with non-expanding foam suitable for window installation or other insulation materials as noted in the Architectural Specifications, Shop Drawings and Manufacturer's Instructions.
- F. Install sealant and backing materials as specified in Section 07 92 00.
- G. Adjust operable hardware for smooth operation and tight fit of sash.
- H. Protect window at both exterior and interior of frame, surrounding trims, flashings, sash and glass with covering after installation to protect window from construction debris and dust etc. Do not remove until final cleaning and acceptance by owner. Coordinate with owner's representative as to sequencing of cleaning and protection of installed windows.
- I. Contractor's responsibility to make all necessary final adjustments to attain normal operation of each window and its mechanical hardware.

3.3 CLEANING

- A. Remove protective material from prefinished aluminum surfaces.
- B. Wash down exposed surfaces using a solution of mild detergent in warm water. Rinse with clean water, and wipe dry with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.
- D. Protect window at both exterior and interior of frame, surrounding trims, flashings, sash and glass with covering after installation to protect window from construction debris and dust etc. Do not remove until final cleaning and acceptance by owner. Coordinate with owner's representative as to sequencing of cleaning and protection of installed windows.

3.4 MAINTENANCE INSTRUCTIONS

- A. Provide training on window replacement and re-glazing methods for window installation contractor and the District Staff

END OF SECTION 08 51 13

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Door hardware for hollow steel and wood doors.
- B. Thresholds.
- C. Weather, smoke and sound seals.
- D. Hardware for miscellaneous applications, such as padlocks for roof hatch and gates.

1.02 RELATED SECTIONS

- A. Division 1
- B. Section 05 50 00 – Anchors and Fasteners: General requirements for anchors and fasteners to building substrates.
- C. Section 06 20 00 – Finish Carpentry and Millwork
- D. Section 08 11 13 – Hollow Metal Doors and Frames: Preparations for door hardware.
- E. Section 08 31 13 – Access Doors and Frames
- F. Section 10 14 00 – Signage: Toilet room door signs; wheelchair accessibility symbol at entrance doors.

1.03 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Company specializing in manufacture of door hardware with a minimum of three years' experience.
- B. Supplier's Qualifications: Company specializing in supplying architectural finish hardware, with warehousing facilities, who has been furnishing hardware for institutional projects in the vicinity of the Project for not less than three years and who is, or who employs, an Architectural Hardware Consultant.
- C. Hardware Supplier's Personnel: Supplier shall employ a certified Architectural Hardware Consultant (AHC) certified by the Door and Hardware Institute to prepare the door hardware schedule utilizing products specified in this Section and complying with applicable Code requirements and requirements of the manufacturers. AHC shall also assist District's Representative with keying instructions.
- D. Coordination: Coordinate door hardware with Work specified in other Sections, including internal reinforcements, templates and other preparations for door hardware, lock cylinders and padlocks.
- E. Sequencing: Provide door hardware on building perimeter doors, with construction keying, to secure the project at the earliest date possible after close-in of the building. Coordinate installation with related Sections.
- F. Submittals Coordination: Make submittals of doors, doorframes and door hardware

concurrent for coordinated review.

- G. Regulatory Requirements: Conform to applicable requirements of authorities having jurisdiction, for fire-rated doors and frames and for accessible use, including the following:
 - 1. NFPA International:
 - a. NFPA 80 - Standard for Fire Doors and Windows
 - b. NFPA 105 - Recommended Practice for the Installation of Smoke-Control Door Assemblies
 - c. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies
 - 2. California Building Code (CBC):
 - a. Requirements for installation of fire door hardware, fire door frames, and anchorage
 - b. Requirements for fire and smoke seals, including positive-pressure test
 - c. Requirements for exit door hardware
 - 3. California Building Code (CBC) (Title 24): Accessibility requirements for individuals with disabilities and door pull forces at accessible doors, including CBC Sections 1003.3.1.8, 11B-404.2.7 and 11B-404.2.8.1.
- H. Fire Door Hardware: Tested for compliance with NFPA 80 and for positive pressure test of door frame and hardware assembly as required by UBC Standard 7-2 and UL-10C.
 - 1. Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
 - 2. Listing in current classification publications of the following agencies will be considered evidence of acceptable testing:
 - a. Underwriters Laboratories Inc. (UL)
 - b. Warnock Hersey International Inc. (WHI)
 - c. Factory Mutual System (FM)
 - d. Other agencies acceptable to authorities having jurisdiction
 - 3. Provide permanent labels on all hardware indicating the listing agency and conditions of the listing.
- I. Installation Certification: Architectural Hardware Consultant (AHC) shall inspect completed installation and certify that door hardware has been provided in accordance with manufacturer's instructions, the Specifications and California Building Code (CBC).

1.04 WARRANTY

- A. Manufacturer's Extended Guaranty, Door Hardware: Furnish manufacturer's extended guaranty for the following, agreeing to repair or replace defective products for specified period from date established by date of completion, except for failures due to abnormal operation or abuse.
 - 1. Mortise locksets: Five years.
 - 2. Cylindrical locksets: Five years.

3. Door closers: Ten years.
 4. Exit devices: Three years.
 5. Butt hinges: Life of the building.
 6. All other Hardware: Two years.
- B. Contractor's Extended Warranty: Contractor and hardware supplier shall jointly provide extended warranty stating, "For a period of not less than two (2) years from date established by date of completion, we [CONTRACTOR NAMES] will service and or replace, at no charge to the District, any part proving defective due to faulty materials or installation. This warranty does not cover abnormal operation or abuse."

1.05 MAINTENANCE

- A. Maintenance Materials: Provide special tools applicable to each door hardware product requiring such tools for maintenance and repair. Tools shall be as supplied or recommended by door hardware manufacturer.
- B. Extra Materials: Provide extra materials for repair and replacement as specified in PART 2 and PART 3 herein. When specified, provide the following extra materials of the same materials utilized on the Project: butt hinges (6 each); manual flush bolts (2 each); stops and holders (2 each); floor stops (4 each); electronic locksets (1 each)
- C. Maintenance Service: Hardware supplier shall provide letter agreement to District that, approximately 6 months after Contract closeout, supplier shall return to the Project, accompanied by representatives of manufacturers of locking/latching devices and door closing control devices, and accomplish the following:
1. Check and readjust every item of hardware.
 2. Consult with and instruct District's personnel in recommended additions to maintenance procedures.
 3. Replace hardware items which have deteriorated or failed due to other than misuse or abuse.
 4. Prepare a written report of current and predictable problems of substantial nature in the performance of door hardware.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers: Listed below are specified manufacturers, whose products are the basis of the design, and acceptable manufacturers, whose equivalent products the Contractor may use in accordance with the "or equal" provision of the Contract Documents.

Product	Specified Manufacturer	Acceptable Manufacturer Substitutions
Continuous Stainless Steel Pin and Barrel Hinges	Markar	Stanley Hardware or Ives Hardware
Mortise Latchsets and	Schlage Lock Co.	No known equals

Locksets		
Lock Cylinders standard non-IC Format	Schlage Lock Co.	Proprietary Keyway - No known equals
Surface Overhead Door Closers	LCN Closers	No known equals
Push/Pull Plates	Ives Hardware	Trimco or Hager Companies
Kickplates	Ives Hardware	Trimco or Hager Companies
Stops and Holders	Ives Hardware	Trimco or Hager Companies
Thresholds	Pemko	Reese Enterprises, Inc or National Guard Products
Weather Seals and Smoke Seals	Pemko	Reese Enterprises, Inc or National Guard Products
Floor Stops	Ives Hardware	No known equals

2.01 DOOR HARDWARE, GENERAL

- A. Door Hardware, General:
 - 1. Provide all door hardware necessary to complete the Work.
 - 2. Provide door hardware complying with accessibility requirements of California Building Code (CBC), including Sections 1003.3.1.8, 11B-404.2.7 and 11B-404.2.8.1.
 - 3. Provide door hardware as scheduled in DOOR HARDWARE SCHEDULE located at the end of PART 3 of this Section.
- B. Manufacturers: Obtain all items of each type from the same manufacturer.
 - 1. Manufacturer's Name Plates: Do not use products which have manufacturer's name or trade name displayed in a visible location.
 - 2. Exception: Required fire labels.
 - 3. Exception: As directed by or acceptable to the Architect.
 - 4. Exception: Manufacturer's identification on rim of lock cylinders.
- C. Manufacturer's Catalog Numbers: Catalog numbers are indicated in the DOOR HARDWARE SCHEDULE to establish operation, function, quality, weight, size, pattern, design, material, and finish required.
- D. Standards Conformance: Provide hardware manufactured to conform to published templates.

- E. Templates: All hardware applied to metal doors or jambs shall be made to template and secured by machine screws. Furnish templates to the metal door and frame manufacturer for application at the factory, unless otherwise requested.
- F. Scope: Provide all hardware necessary to complete Work. Products not specifically identified but necessary shall be provided of type and quality generally recognized in door hardware industry for service duty of Project type, location and usage, as selected by Contractor and subject to acceptance by District's Representative and Architect.
- G. Adaptation: Should specified hardware conflict with configuration of doors, frames and surrounding construction, provide comparable alternative hardware which maintains intended function of door, as selected by Contractor and subject to review and acceptance by District's Representative and Architect.

2.02 FASTENERS

- A. Fasteners, General: Furnish type, quality, size and quantity for long-life installation under hard usage. Conform to manufacturer's instructions and recommendations for fasteners and installation and the following minimum requirements. Provide fasteners which are suitable for the substrate.
- B. Expansion Shields, Hex Bolts and Other Anchors: Provide anchors and fasteners as recommended by hardware manufacturer, subject to review by Architect, and in conformance to fastener requirements specified in Section 05 05 23 - Anchors and Fasteners. Do not use toggle anchors or powder-actuated fasteners.
- C. Concrete and Masonry Substrates: Furnish hardware with machine screws and expansion anchors.
- D. Fastener Finishes: Match hardware item, typically. Provide stainless steel fasteners at aluminum and stainless steel hardware. Provide corrosion-resistant (zinc-plated steel or stainless steel) at exterior exposure, unheated spaces and damp atmospheres such as rooms with food service cooking and cleaning equipment.
- E. Fasteners at Fire Doors: Conform to labeling requirements of door, frame and hardware. At wood doors, provide sex-nut through-bolts for operating hardware typically unless permitted otherwise by hardware listing.

2.03 HARDWARE FINISHES

- A. Hardware Finishes, General: Provide finishes matching ANSI/BHMA A156.18 designations indicated in DOOR HARDWARE SCHEDULE.
 - 1. Metal finishes: At Contractor's option, stainless steel may be provided instead of satin chrome plating. Where stainless steel is indicated, substitution of satin chrome plating will not be acceptable.
 - 2. Plastic and painted finishes: Color shall be selected by Architect from manufacturer's full selection to match hardware, if not otherwise indicated.
- B. Chrome, Satin Finish: Scheduled as 626.
 - 1. Plated on steel: BHMA 652 (US26D).
 - 2. Plated on brass or bronze: BHMA 626 (US26D).
- C. Stainless Steel: Scheduled as 630. Provide as scheduled and as alternative to Satin Finish Chrome finish at Contractor's option.
 - 1. Polished: BHMA 629 (US32).

2. Brushed: BHMA 630 (US32D).
- D. Aluminum:
1. Manufacturer's standard finish: Indicated as AL or ALUM, either satin anodized or clear coated as standard with product manufacturer.
 2. Satin anodized, natural metal color: BHMA 628.
 3. Clear coated: BHMA 673.
 4. Manufacturer's standard finish: Indicated as ALUM, either satin anodized or clear coated as standard with product manufacturer.
1. Powder coated: Proprietary powdered stainless steel (PemKote).
- E. Primer Coat:
1. Primer on steel: BHMA 600 (PC).
 2. Primer on brass or bronze: BHMA 163 (PC).
- F. Mill Finish: For brass and aluminum, as noted, MILL.
- G. Colored Finishes:
1. Factory Colored Coatings: Color code as indicated, corresponding to specified manufacturer's coating type and color.
 2. Surface Door Closers: Factory finished on exposed metal and plastic components, to match door hardware finish color, unless otherwise noted.

2.04 FIRE-RATED HARDWARE

- A. Fire-Rated Door Assemblies: Tested for compliance with NFPA 80 and for positive pressure test of door frame and hardware assembly as required by UBC Standard 7-2 and UL-10C.
1. Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
 2. Provide permanent labels on all hardware indicating the listing agency and conditions of the listing.
 3. Listing in current classification publications of the following agencies will be considered evidence of acceptable testing:
 - a. Underwriters Laboratories Inc. (UL).
 - b. Warnock Hersey International Inc. (WHI).
 - c. Factory Mutual System (FM).
 - d. Other agencies acceptable to authorities having jurisdiction.
- B. Fire-Rated Hardware: Provide UL-listed and approved hardware for fire-labeled assemblies in compliance with NFPA 80.
1. Confirm that hardware provided conforms to fire tested assembly (coordinate with doors provided).
 2. Where exit devices are provided on fire-rated doors, provide door with UL fire door label indicating, "Fire Door to be Equipped with Fire Exit Hardware", and provide door hardware with UL exit device label indicating "Fire Exit Hardware".

- C. Hinges at Fire-Rated Assemblies: Steel base material only.
- D. Closers: Bolted (not screwed) to door reinforcement or through-bolted with sex-nut fasteners.
- E. Latchbolts: 1/2-inch minimum throw or as required for fire rated assembly label.

2.05 EXIT DOOR HARDWARE

- A. Exit Door Hardware: Provide UL listed and approved hardware for exit (panic) door operation.
- B. Exit Door Hardware Operation: Exit doors shall be openable at all times from the inside without use of key or special knowledge or effort.
- C. Door Closers at Exit Doors: Closers shall comply with California Building Code (CBC), wheelchair accessibility regulations, and door pull forces at accessible doors, including CBC Sections 11B-404.2.7, 11B-404.2.8.1, 11B-404.2.9 and 1003.3.1.8. Pressure required at doors with closers shall not exceed:
 - 1. Fire-rated doors: 5 pounds (38 n). If approved by Authority having Jurisdiction, increase closing force as necessary to achieve positive latching but not exceeding 15 pounds, in compliance with California Building Code (CBC) Section 11B-404.2.9.
 - 2. All other doors: 5 pounds (38 n).

2.06 HINGES

- A. Continuous Hinges: Stainless steel, pin and barrel.
 - 1. At all exterior door locations.
 - 2. Modernization projects: Use half-surface hinges.
 - 3. New Construction: Use full mortise hinges.
- | Door Thickness | Door Width | Hinge Height | Hinge Weight |
|----------------|------------------------|--------------|--------------|
| 1-3/4 inches | to 36-inches | 4-1/2 inches | Standard |
| 1-3/4 inches | 37-inches to 42-inches | 5-inches | Heavy |
| 1-3/4 inches | over 42-inches | 5-inches | Extra heavy |
- B. Butt Hinge Width: Unless otherwise specified, the width of butt hinges shall be sufficient to clear frame and trim projection when door swings 180 degrees.
 - C. Butt Hinge Quantity: As scheduled. If not scheduled or otherwise indicated, provide three hinges per leaf to 7'-6" height. Add one for each additional 30 inches in height or fraction thereof.
 - D. Hinge Tips: Standard flat tips.
 - E. Continuous stainless steel pin and barrel Hinges:
 - 1. At all exterior locations
 - 2. Modernization projects: Use half-surface hinges.
 - 3. New construction: Use full mortise hinges.

2.07 LATCHSETS AND LOCKSETS

- A. Latchsets and Locksets, General: Exit doors shall be openable from the inside without the use of a key or any special knowledge or effort, in compliance with California Building Code (CBC)

Section 1003.3.1.8.

- B. Mortise Latchsets/Locksets: Schlage L9000 Series, 06N Design escutcheon. See DOOR HARDWARE SCHEDULE for latchset/lockset catalog numbers and functions.
 - 1. L9070 or L9071 install at Classrooms, Offices and Workrooms
 - 2. L9080 install at Storage Rooms and Equipment Rooms
 - 3. L9076P install at Multi-occupancy Student Restrooms
 - 4. L9485 install at Faculty Restrooms
 - 5. No T-turns i.e. L9050
- C. Latchbolts: Throw shall conform to fire label requirements.

2.09 LOCK CYLINDERS, KEYING AND KEYS

- A. Lock Cylinders Standard Non-IC Format: Key system shall be Schlage "Quad" or Schlage "Everest" D Sections Keyway, zero bitted with 5 key blanks each un-embossed both sides.
 - 1. Match existing if all doors are not being replaced; confirm with District.
- B. Keying: All keying to be done by the District.
 - 1. Deliver all cylinders and key blanks to District 120 days prior to installation for keying.
 - 2. All permanent keyed cylinders to be installed by District.
 - 3. Temporary construction cylinders for all doors to be provided by District for installation by the contractor. Cylinders to be installed on both sides of door including all mullions, if applicable.
 - a. Contractor to provide itemized list of cylinders needed within minimum thirty (30) days advance notification

2.8 SURFACE OVERHEAD DOOR CLOSERS

- A. Surface Overhead Door Closers: Rack and full compliment bearing double heat treated pinion gear with removable non-ferrous case and cast iron body. See DOOR HARDWARE SCHEDULE for products.
 - 1. Provide closers non-handed, non-sized and adjustable, LCN 4041 RW/PA – No EDA.
 - 2. All closers to be parallel-arm mounted on push side of door.
 - 3. Exterior door closers shall have been successfully tested to 100 hours of ASTM B117 salt spray test.
 - 4. Exterior doors shall not require seasonal adjustments in temperatures from 120 degrees F to -30 degrees F.
 - 5. Provide through-bolts at wood doors.
 - 6. Provide flush transom offset brackets where parallel arm closers are listed for doors with fixed panels over.
 - 7. Provide drop brackets at narrow head rails.
 - 8. Provide screw spacers as necessary for parallel-arm brackets.

- B. Wheelchair and Persons with Disabilities Accessibility Provisions: Reduced operating force design, complying with California Building Code (CBC) for accessible use. See DOOR HARDWARE SCHEDULE for products.
 - 1. Maximum effort to operate doors shall not exceed 5 pounds (38 n), such pull or push effort being applied at right angles to hinged doors and at the center plane of sliding or folding doors, in compliance with California Building Code (CBC) Section 11B-404.2.9.
 - 2. Compensating devices or automatic door operators may be utilized to meet the above standards.
 - 3. If approved by Authority having Jurisdiction for fire doors, increase closing force as necessary to achieve positive latching but not exceeding 15 pounds, in accordance with California Building Code (CBC) Section 11B-404.2.9.
 - 4. Door closer shall be adjusted to that sweep period of door from open (70 degrees) position to point 3-inches from latch, measured on the landing side of the door, shall be minimum of 3 seconds, in compliance with California Building Code (CBC) Section 11B-404.2.8.1.
- C. Door Closer Finishes: Provide metal covers and exposed arms painted to approximate plated finish.

2.9 PUSH/PULL PLATES

- A. Stainless Steel Push/Pull Plates: 0.050-inch, fully rounded top and bottom. See DOOR HARDWARE SCHEDULE for products and sizes.
- B. Plated Brass Push/Pull Plates: Cold-forged, 0.050-inch. See DOOR HARDWARE SCHEDULE for products and sizes.

2.10 KICKPLATES

- A. Kickplates: 0.50-inch thick stainless steel, with four beveled edges. Provide machine or wood screws of stainless steel. See DOOR HARDWARE SCHEDULE for products.
- B. Kickplate Sizes:
 - 1. Single doors: Door width less 2-inches.
 - 2. Double doors: Door width less 1-inch.
 - 3. Height: As scheduled, 10-inches typically.

2.11 DOOR BUMPERS AND DOOR STOPS

- A. Door Bumpers and Door Stops: See DOOR HARDWARE SCHEDULE for products.
 - 1. Unless otherwise noted in the DOOR HARDWARE SCHEDULE, provide floor type with appropriate fasteners. Provide a minimum of two fasteners per door stop.
 - 2. Locations:
 - a. Exterior Applications: Ives FS18S, or approved equal.
 - b. Interior Applications: Ives FS448, or approved equal.
 - 3. Only use overhead door stops when a floor type door stop cannot be installed. Floor or ground stops shall be 4" maximum from the wall or partition.

- B. Fasteners:
1. Anchors to concrete and masonry substrates: Provide expansion anchors. Refer to Section 05 05 23 - Anchors and Fasteners.
 2. Anchors to steel framing: Provide sheet metal screws into framing or into sheet metal backing. Provide expansion anchor.
 3. Anchors to wood framing: Provide wood screws or sheet metal screws into framing or into solid wood backing.
 4. Do not use toggle or molly-type anchors. Do not use powder-actuated driven fasteners.

2.12 THRESHOLDS

- A. Thresholds, General: Wheelchair-accessible design, complying with California Building Code (CBC) Section 11B-404.2.5. See DOOR HARDWARE SCHEDULE for products. Provide closed end returns where threshold extends beyond face of door frame.
- B. Fasteners:
1. Non-ferrous, 1/4-inch fasteners, Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (FHSL).
 2. Provide countersunk, corrosion-resistant fasteners.
 3. At concrete slab on grade, provide expansion anchors.
 4. Fasteners shall comply with general requirements for anchors and fasteners specified in Section 05 05 23 - Anchors and Fasteners.

2.13 WEATHER, SOUND AND SMOKE SEALS

- A. Weather Seals: Provide at all exterior doors. See DOOR HARDWARE SCHEDULE for products.
- B. Sound Seals: Provide at interior doors as scheduled. See DOOR HARDWARE SCHEDULE for products.
- C. Smoke Seals: See DOOR HARDWARE SCHEDULE for products. Provide UL-listed and UL-labeled smoke seals at all fire-rated door assemblies.
1. Contractor shall provide intumescent seals complying with test requirements of door frame and door.
 2. Intumescent seals shall be concealed when door is closed and not rely upon exposed fasteners.

PART 3 - EXECUTION

3.01 HARDWARE LOCATIONS

- A. Door Hardware Locations, General:
1. Conform to the mounting locations specified herein, except where otherwise shown on Drawings, otherwise indicated in reference standards or otherwise required by governing authorities having jurisdiction.
 2. In case of conflict or variance with the mounting methods or locations specified herein, submit in writing to Architect a listing of all conflicts or variances, along with

recommended mounting methods and locations for clarification and direction.

B. Door Hardware Locations, Specific:

1. Levers: 38-inches from finished floor to center of lever, in compliance with CBC Section 11B-404.2.8.1.
2. Door Pulls, Pushplates, and Push Bars: 44-inches maximum from finished floor to center line, in compliance with CBC Section 11B-404.2.8.1.
3. Exit Device Crossbar: 38-inches from finished floor to centerline of crossbar, in compliance with CBC Section 11B-404.2.8.1.
4. Floor stops: Furthest point of stop to be a maximum of 4-inches from the face of wall or partition, in compliance with California Building Code (CBC).

3.02 HARDWARE INSTALLATION

- A. Hardware Installation: Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing Work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
 3. Ensure that all hardware on fire and exit doors bears appropriate UL label.
- B. Hardware Installation at Steel Doors: Comply with DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
1. Install hardware in accordance with manufacturer's printed instructions and recommendations and in conformance with fire and exiting label requirements.
 2. Fasten hardware to internal reinforcement of door with machine screws. Fasten light hardware to door face with sheet metal screws.
- C. Hardware Installation at Wood Doors: Comply with DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors." Fasten hardware to door with full-thread wood screws or sheet metal screws, except at fire labeled doors use sex-nut through fasteners.
- D. Hardware Installation at Fire Doors and Exit Doors:
1. Install fire door hardware in conformance to NFPA 80.
 2. Install exit door hardware in conformance to NFPA 101.
 3. Ensure that all hardware on fire and exit doors bears appropriate UL label.
- E. Hardware Installation to Walls and Floors: Refer to Section 05 05 23 - Anchors and Fasteners for general requirements for anchors and fasteners to building substrates.
1. Coordinate backing requirements and installation at wood and metal stud framing.
 2. Refer to Section 05 05 23 - Anchors and Fasteners for general requirements for anchors and fasteners to building substrates.
 - a. Refer to Section 05 05 23 - Anchors and Fasteners for concrete anchors.
 - b. Do not use toggle or wing-type anchors.

- c. Secure hardware to concrete and masonry substrates with expansion anchors. Do not use powder-actuated driven fasteners.

3.03 DEMONSTRATION

- A. Hardware Demonstration: In the presence of Project Inspector, demonstrate proper operation of all doors.
- B. Demonstrate that permanent keys operate applicable locks.
- C. Demonstrate that all fire and exit doors operate in proper sequence and with no greater than specified maximum force on operating hardware.

HW SET: 415

1	EA	HALF SURF CONT HINGE	HS303	630	MAR
1	EA	HOLDBACK LOCK	L9076L 06N X L/OST	626	SCH
1	EA	MORTISE CYLINDER	30-021	626	SCH
1	EA	PERMANENT CORE	23-030 ZERO BITTED QUAD KEYWAY SEE SPECS	626	SCH
1	EA	PUSH PLATE	8200 4" X 16" CUT FOR CYL	630	IVE
1	EA	CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	MOP PLATE	8400 4" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	328AA HEAD AND JAMBS	AL	ZER
1	EA	SWEEP	339A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

NOTE: ALL CLOSERS TO BE MOUNTED PARALLEL ARM. MOUNT ON PUSH SIDE OF DOOR

HW SET: 428.1

1	EA	HALF SURF CONT HINGE	HS303	630	MAR
1	EA	HOTEL LOCK	L9485 OS-OCC w/XL13-439	626	SCH
1	EA	MORTISE CYLINDER	30-021	626	SCH
1	EA	PERMANENT CORE	23-030 ZERO BITTED QUAD KEYWAY SEE SPECS	626	SCH
1	EA	CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	328AA HEAD AND JAMBS	AL	ZER
1	EA	SWEEP	339A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

NOTE: ALL CLOSERS TO BE MOUNTED PARALLEL ARM. MOUNT ON PUSH SIDE OF DOOR

HW SET: 455

1	EA	HALF SURF CONT HINGE	HS303	630	MAR
1	EA	STOREROOM LOCK	L9080L 06N	626	SCH
1	EA	MORTISE CYLINDER	30-021	626	SCH
1	EA	PERMANENT CORE	23-030 ZERO BITTED QUAD KEYWAY SEE SPECS	626	SCH
1	EA	CLOSER	4040XP HW PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	626	IVE
1	SET	PERIMETER SEALS	328AA HEAD AND JAMBS	AL	ZER
1	EA	SWEEP	339A	AL	ZER
1	EA	THRESHOLD	AS DETAILED	AL	ZER

NOTE: ALL CLOSERS TO BE MOUNTED PARALLEL ARM. MOUNT ON PUSH SIDE OF DOOR

END OF SECTION 08 71 00

SECTION 08 80 00 GLAZING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Related Sections
 - 1. 07 92 00: Joint Sealants
 - 2. 08 11 13: Hollow Metal Doors and Frames (for non-rated doors)
 - 3. 08 51 13: Aluminum Windows

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Insulated glass.
 - 2. Laminate glass.
 - 3. Fire resistive glazing.
 - 4. Glazing sealants.
 - 5. Accessories necessary for a complete installation.

1.3 DEFINITIONS

- A. Glass Thickness: Indicated by thickness designations in millimeters according to ASTM C1036.
- B. Interspace: Space between lites of an insulating glass unit.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design glass panels including comprehensive engineering analysis by a qualified professional engineer lawfully licensed in the State of California, using performance requirements and design criteria indicated.
- B. Installed Glazing: Design glazing systems to withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- C. Structural Performance:
 - 1. Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the CBC and ASTM E1300:
 - a. Design Wind Pressures: Indicated on Structural Drawings.
 - b. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE 7, based on heights above grade indicated on Drawings:
 - 1) Wind Design Data: As indicated on Drawings.
 - 2) Basic Wind Speed: 115 mph.
 - 3) Importance Factor: 1.0.
 - 2. Exposure Category: D.
 - 3. Design Snow Loads: Indicated on Drawings.
 - 4. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest

- part of the glass.
 - 5. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
 - 6. Maximum Lateral Deflection: For glass supported on all four edges, limit center of glass deflection at design wind pressure to not more than 1/50 times the short side length or 1-inch, whichever is less.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties:
- 1. Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 - a. For monolithic glass lites, properties are based on units with lites 6 mm thick.
 - b. For laminated glass lites, properties are based on products of construction indicated.
 - c. For insulating glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 - d. U-Factors: Center of glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 - e. Solar Heat Gain Coefficient and Visible Transmittance: Center of glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 - f. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

1.5 SUBMITTALS

- A. Product Data: Technical data for each type of product including recommended installation and cleaning procedures.
- B. Glass Samples: For each type of glass required. Prepare samples from same material to be used for Work.
- C. Glazing Schedule: List glass types and thickness for each size opening and location. Use same designations indicated on Drawings.
- D. Delegated Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Product Certificates:
 - 1. Submit glass product certificates required by Code:
 - a. Glass Manufacturer Certificate: The glass manufacturer shall submit a letter certifying it has reviewed the glazing details proposed for the project, including the use of gaskets and sealants, and that each product furnished is recommended for the application shown and compliance with the Code.
- F. Thermal Stress and Wind Load Analyses:
 - 1. Submit the following from the glass manufacturer:
 - a. Thermal stress analysis for each exterior glass unit type, each building elevation. The analysis shall clearly indicate the expected service temperature ranges and the effects of partial and full shading on the glass:
 - 1) Attach to the thermal stress analysis a statement from the glass manufacturer that based upon this analysis that the resulting thermal stresses will not reduce the specified statistical probability of breakage.

2. Wind load analysis for each glass unit type, each building elevation. The analysis shall indicate the statistical probability of breakage at the design wind pressure does not exceed the specified statistical probability of breakage.

G. Product Test Reports:

1. Submit test reports for insulating glass and glazing sealants, for tests performed by a qualified testing agency:
 - a. Glazing Sealants: Provide test reports based on testing current sealant formulations within previous 36 month period.
 - b. Glazing Sealants: Preconstruction adhesion and compatibility test report.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with applicable requirements of the CBC for glazing.
2. Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies:
 - a. As a minimum provide Category II materials complying with testing requirements in 16 CFR 1201 (Consumer Product Safety Commission *Safety Standard for Architectural Glazing Materials*, published in the Code of Federal Regulations) and ANSI Z97.1.
 - b. Permanently mark safety glass with certification label of Safety Glazing Certification Council.
3. Insulating Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
4. Comply with published recommendations of glass product organizations:
 - a. GANA: Glazing Manual.
 - b. IGMA: SIGMA TM-3000 Vertical Glazing Guidelines.
 - c. GANA: Laminated Glazing Reference Manual.
 - d. AAMA: AAMA GDSG-1 Glass Design for Sloped Glazing.
 - e. AAMA: TIR A7 Sloped Glazing Guidelines.
 - f. IGMA for Sloped Glazing: IGMA TB-3001 Guidelines for Sloped Glazing.
 - g. IGMA for Insulating Glass: SIGMA TM-3000 North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use.
5. Fire Rated Door Assemblies: Assemblies complying with NFPA 80 listed and labeled by UL for fire ratings indicated, based on testing according to NFPA 252.
6. Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated:
 - a. Minimum Glass Thickness for Exterior Lites: 1/4 inch (6 mm).
 - b. Thickness of Tinted Glass: Provide same thickness for each tint color indicated.
7. Where annealed float glass is indicated, provide annealed float glass, heat strengthened float glass, or fully tempered float glass necessary to comply with performance requirements:
 - a. Where heat strengthened float glass is indicated, provide heat strengthened float glass or fully tempered float glass necessary to comply with performance requirements.
 - b. Where fully tempered float glass is indicated, provide fully tempered float glass.

B. Manufacturer Qualifications for Insulating Glass Units with Sputter Coated, Low E Coatings: Insulating glass manufacturer who is approved and certified by coated glass manufacturer.

C. Installer Qualifications, Glazer: Experience entity having minimum 5 years documented experience and who employs glass installers certified under the National Glass Association's Certified Glass Installer Program.

- D. Installer Qualifications, Decorative Film: Experience entity having minimum 5 years documented experience in the installation of glass films.
- E. Source Limitations for Glass and Glass Accessories: Obtain each type of glass and glass accessories from a single source.
- F. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- G. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
- H. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
- I. Install glazing in mockups specified to match glazing systems required for Project, including glazing methods:
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- J. Preconstruction Adhesion and Compatibility Testing:
 - 1. Test each glass product, tape sealant, gasket, glazing accessory, and glass framing member for adhesion to and compatibility with elastomeric glazing sealants:
 - a. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 - b. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - c. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 - d. Schedule enough time for testing and analyzing results to prevent delaying the Work.
 - e. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.
- K. Pre-installation Conference: Conduct conference at site.

1.7 WARRANTY

- A. Written warrant, executed by glass manufacturer agreeing to repair or replace **glass** units that fail in materials and workmanship or deteriorate within warranty period. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to decorative glass manufacturer's published instructions:
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.
- B. Written warranty signed by manufacturer in which glass manufacturer agrees to replace **coated glass** units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating:
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- C. Written warranty signed by manufacturer in which manufacturer agrees to replace

laminated glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard: Provide manufacturer's warranty on laminated glass units to remain laminated.

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

- D. Written warranty signed by manufacturer in which manufacturer agrees to replace **insulating glass** units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass:

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

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by manufacturer.
- D. Exercise exceptional care to prevent edge damage to glass, and damage/deterioration to coating on glass.
- E. Comply with insulating glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 EXTRA STOCK

- A. Provide one pane of glass for each glass size on the project.

1.10 PRE-INSTALLATION MEETING

- A. Schedule a pre-installation meeting with Architect, Owner's Representative, and General Contractor in attendance.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturers are subject to compliance with requirements; provide products by one of the following:
1. Glass:
 - a. **Vitro Architectural Glass (Basis of Design).**
 - b. AGC Glass Company North America, Inc.
 - c. Cardinal Glass Industries.
 - d. Guardian Industries Corp.;
 - e. Pilkington North America.

- f. Viracon.
 - 2. Fire Protection Rated Glazing:
 - a. AGC Glass Company North America, Inc.
 - b. Pilkington North America.
 - c. SAFTI FIRST Fire Rated Glazing Solutions.
 - d. Schott North America, Inc.
 - e. Technical Glass Products.
 - 3. Fire Resistive rated glazing
 - a. AGC Pyrobel by McGrory Glass
- B. Adhered Backing:
- 1. Adhered scrim backing to ceramic coated surface; provide backed units identical to materials which, while possibly developing cracks and fissures, show no shear nor develop any openings large enough for the unobstructed penetration of 3 inch diameter sphere when tested by approved independent testing laboratory:
 - a. Mount test specimens consisting of 3 glass assemblies, 34" x 76" (plus zero or minus 3/16 inch), for testing as specified in ANSI Z-97.1.
 - b. Expose specimens to 100 cycles of the following conditions:
 - 1) 1 hour at 0 degrees F, ambient humidity.
 - 2) 3 hours increase from 0 degrees F to 140 degrees F, 95 to 100 percent relative humidity.
 - 3) 1 hour at 140 degrees F, 95 to 100 percent relative humidity.
 - 4) 3 hours decrease from 140 degrees F to 0 degrees F, ambient humidity.
 - c. Break glass by spring loaded prick punch at midpoint of either vertical edge.
 - d. After breaking glass, subject it to pressure of 4 lbf per sq. ft. for 5 minutes to simulate wind load.
 - e. Inorganic Opacifier: Provide polyethylene opacifier where no insulation and other backing material is applied directly to spandrel glass. Use polyester where direct attachment does occur.
 - f. Fallout Resistance: Provide spandrel units identical to those passing fallout resistance test for spandrel glass specified in ASTM C1048.

2.2 LAMINATED GLASS

- A. ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation:
 - 1. Construction: Laminate glass with cast in place and cured transparent resin interlayer to comply with interlayer manufacturer's written instructions.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Thickness: (See Schedule).
 - 4. Interlayer Color: Clear unless otherwise indicated.
- B. Windborne Debris Impact Resistant Laminated Glass: Comply with requirements for laminated glass except laminate glass with ionomeric polymer interlayer to comply with interlayer manufacturer's written instructions:

2.3 INSULATING GLASS

- A. Factory assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190.
- B. **Performance Properties:**
 - 1. Basis of Design Product: Vitro Architectural Glass:
 - 2. Overall Unit Thickness: 1 inch.

1/4" Monolithic Glass + 1/2" Air gap + 1/4" Laminated glazing

3. Window sash assemblies to be factory glazed with insulated glass units.
 4. Safety glazing required.
 5. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch thick, minimum. Do not tint glazing; Low E coatings should remain as clear and non-reflective as possible.
 6. Provide hard coat Low-E glass. Low-E coating should be placed on at least one of the glass surfaces facing the air space.
 7. The maximum U values, maximum solar heat gain coefficient, and minimum visible transmittance must meet the most current Building Energy Efficiency Standards Prescriptive Requirements of additions or alterations, unless the Performance based Title 24 calculations recommend more stringent values.
 8. Glass:
 - a. 1/4-inch thickness, min for each pane of glass.
 - b. Roller Wave: 0.004 inch Average Peak to Valley Measurement (APVM), max.
 - i. Provide documentation of glazing panels indicating APVM of glazing panels certified by manufacturer, to be submitted with delivery of glazing.
- C. Sealing System:
1. Dual seal, with polyisobutylene and silicone primary and secondary sealants:
 - a. Spacer: Aluminum with black, color anodic finish. Thermally broken aluminum.
 - b. Manufacturers: Subject to compliance with requirements, provide products by Technoform Glass Insulation NA, Inc.
 - c. Desiccant: Molecular sieve or silica gel, or a blend of both.
- D. Fire Protection Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire protection ratings indicated, based on positive pressure testing according to NFPA 257 or UL 9, including the hose stream test, and complying with NFPA 80. For ratings 60 minutes or greater, glazing shall meet the test requirements of ASTM E119 or UL 263.
- E. Fire Protection Rated Glazing Labeling: Permanently mark fire protection rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction indicating manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether or not glazing has passed the hose-stream test; whether or not glazing meets 450 degrees F (250 degrees C) temperature rise limitation; and the fire resistance rating in minutes.
- F. Film Faced Ceramic Glazing: Clear, ceramic flat glass; 5 mm thickness; faced on one surface with a clear glazing film; and complying with 16 CFR 1201, Category II.

2.4 GLAZING ACCESSORIES

- A. Compatibility: Provide glazing sealants compatible with one another and with other materials in contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of service and application, demonstrated by sealant manufacturer based on testing and field experience.
- B. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
- C. Colors of Exposed Glazing Sealants: Selected by Architect.
- D. Glazing Sealant - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 100/50, Use NT:

1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - d. Pecora Corporation.
 - e. Sika Corporation.
- E. Glazing Sealant - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT:
1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. BASF Corporation; Construction Systems.
 - b. Dow Corning Corporation.
 - c. GE Construction Sealants; Momentive Performance Materials Inc.
 - d. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - e. Pecora Corporation.
 - f. Polymeric Systems, Inc.
 - g. Sika Corporation.
- F. Glazing Sealant - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use NT:
1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Bostik, Inc.
 - b. Dow Corning Corporation.
 - c. GE Construction Sealants; Momentive Performance Materials Inc.
 - d. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - e. Polymeric Systems, Inc.
 - f. Schnee-Morehead, Inc., an ITW company.
 - g. Sika Corporation.
- G. Glazing Sealant - Acid curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use NT:
1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. BASF Corporation; Construction Systems.
 - b. Bostik, Inc.
 - c. Dow Corning Corporation.
 - d. GE Construction Sealants; Momentive Performance Materials Inc.
 - e. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - f. Pecora Corporation.
 - g. Polymeric Systems, Inc.
 - h. Schnee-Morehead, Inc., an ITW company.
 - i. Sika Corporation.
- H. Glazing Sealants for Fire rated Glazing Products - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated:
1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 2. Colors of Exposed Glazing Sealants: Selected by Architect.

- I. Back Bedding Mastic Glazing Tapes:
 - 1. Preformed, butyl based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
 - a. Tape, where indicated.
 - b. Tape, for glazing applications in which tape is subject to continuous pressure.
 - c. Tape, for glazing applications in which tape is not subject to continuous pressure.
- J. Expanded Cellular Glazing Tapes:
 - 1. Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - a. Type 1, for glazing applications in which tape acts as the primary sealant.
 - b. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- K. Miscellaneous Glazing Accessories:
 - 1. Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with proven record of compatibility with surfaces contacted in installation:
 - a. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
 - b. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
 - c. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
 - d. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
 - e. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
 - f. Perimeter Insulation for Fire Resistive Glazing: Product approved by testing agency listed and labeled fire resistant glazing product with which it is used for application and fire protection rating indicated.

2.5 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements:
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components:
 - a. Temperature Change: 120 degrees F, ambient; 180 degrees F, material surfaces.
 - 2. Edge and Surface Conditions: Comply with the recommendations of AAMA *Structural Properties of Glass* for clean cut edges, except comply with manufacturer's recommendations.
 - 3. Exposed Glass Edges and Surface Condition: Finish edges flat with an arrissed edge profile (small bevel of uniform width not exceeding 1.5 mm at an angle of approximately 45 degrees to the surface of the glass) with polished (surface is reflective in appearance similar to the major surface of the glass) surface.
- B. Cutting: Wheel cut or sawed edges and seamed at manufacturer's option. For site cut glass, provide glass 2 inches larger than required in both dimensions to facilitate cutting of clean cut edges without the necessity of seaming or nipping. Do not cut, seam, nip or

abrade heat treated glass.

- C. Butt Glazing: Clean cut or flat grind vertical edges of butt glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- D. Edges: Grind smooth and polish exposed glass edges and corners.

2.6 FIELD CONDITIONS

- A. Environmental Limitations:
 - 1. Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes:
 - a. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 degrees F (4.4 degrees C).
- B. Field Measurements: Verify actual dimensions of openings and construction contiguous with decorative glass by field measurements before fabrication.

2.7 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

2.8 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation after correcting unsatisfactory conditions.

2.9 PREPARATION

- A. Clean glazing channels and framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates:
 - 1. Comply with manufacturer instructions for wiping of surfaces immediately before application of primers.
 - 2. Wipe metal surfaces with IPA (isopropyl alcohol) unless otherwise required by compatibility and adhesion testing results.
- B. Inspect each piece of glass immediately before installation. Do not install pieces improperly sized or with damaged edges, scratches, abrasion, or evidence damage. Remove labels from glass immediately after installation.
- C. Examine glazing units to locate exterior and interior surfaces. Label or mark units so exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.
- D. Seal vent (breather or capillary) tubes in insulating glass units in accordance with insulating

glass manufacturer written recommendations.

- E. Glass Film Preparation:
 - 1. Remove particulate matter on the glass surface using a scraping blade.
 - 2. Place an absorbent towel on window sill or sash to absorb moisture generated by the film application.

2.10 GLAZING

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm):
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8 inch (3 mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement:
 - 1. Square cut wedge shaped gaskets at corners and install gaskets as recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

2.11 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.

- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains:
 - 1. If contaminating substances come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

PART 3 SCHEDULE

3.1 TRAINING

- A. Provide two (2), two-hour training sessions on replacing glazing from each type of window frame. Training shall include removal and reinstallation of at least one pane.
- B. Glazing to be installed from inside the building when the top of the panes are over eight feet above grade.

3.2 GLAZING SCHEDULE

- A. G-1 Insulated Glass: 1 inch (25 mm) total thickness consisting of:
1/4" Monolithic Glass + 1/2" Air gap + 1/4" Laminated glazing

END OF SECTION 08 80 00

SECTION 09 21 16 GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Gypsum Board.
 - 2. Reinforced Gypsum Board Sheathing (Tile Backer Board).
 - 3. Cementitious Backer Units.
 - 4. Impact Resistant Gypsum Board.
 - 5. Accessories necessary for a complete installation.
- B. Related Sections:
 - 1. Section 03 30 00: Cast in Place Concrete
 - 2. Section 05 50 00: Metal Fabrications.
 - 3. Section 06 10 00: Rough Carpentry.
 - 4. Section 08 11 13: Hollow Metal Doors and Frames.
 - 5. Section 08 31 13: Access Doors and Frames.
 - 6. Section 08 51 00: Aluminum Windows.
 - 7. Section 09 30 00: Tiling.
 - 8. Section 09 90 00: Painting and Coating.

1.3 PERFORMANCE REQUIREMENTS

- A. Comply with manufacturer's load tables and the following design pressures and deflections:
 - 1. Stairs, Elevator Hoistways, and Vertical Shafts: 1/120 at 10 psf.
 - 2. Ground Floor Lobbies: 1/120 at 15 psf.
 - 3. Partitions Receiving Stone Cladding, Lath and Plaster, or Plaster Veneer: 1/360 at 15 psf.
 - 4. Partitions Receiving Monitors, Televisions, Heavy Audio/Visual Equipment: 1/360 at 15 psf.
 - 5. Typical Partitions: 1/240 at 5 psf.
 - 6. Other Partitions: 1/240 at 5 psf.
 - 7. Maximum Deflection:
 - a. L/240 at 5 lbf per sq. ft.
 - b. L/120 at 5 lbf per sq. ft.
 - c. L/120 at 7.5 lbf per sq. ft.
 - d. L/120 at 10 lbf per sq. ft.
- B. Fire Resistance Rated Assemblies: For fire resistance rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- C. STC Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

- D. All gypsum boards to be mildew and mold resistant, with a score of 10 on ASTM D3273.
- E.

1.4 SUBMITTALS

- A. Product Data: Submit For each type of drywall including calculations for loadings and stresses of exterior walls and specially fabricated framing based on manufacturer's load tables.
- B. Shop Drawings: Indicate locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.
- C. Samples:
 - 1. Trim Accessories: Full size Sample in 12 inch (300 mm) long length for each trim accessory indicated.
 - 2. Textured Finishes: 12 inches by 12 inches (300 mm by 300 mm) for each textured finish indicated and on same backing indicated for Work.
- D. Calculations: Submit calculations verifying steel partition stud minimum base metal thickness and depth compliance with Code and ASTM C645 for height, load, and deflection.
- E. Evaluation Reports: ICC-ES reports for dimpled steel studs and runners and firestop tracks.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. California Building Code (CBC) (CCR Title 24, Part 2, as adopted and amended by DSA):
 - a. CBC-7 – Chapter 7, Fire Resistant Materials and Construction
 - b. CBC-19A – Chapter 19A, Concrete
 - c. CBC – Chapter 25, Gypsum Board and Plaster.
 - 2. Division of the State Architect, Interpretation of Regulations (DSA-IR):
 - a. DSA-IR 25-3, Drywall Ceiling Suspension Conventional Construction-One Layer.
 - b. DSA-IR 25-2.13, Metal Suspension Systems for Lay in Panel Ceilings.
 - 3. Fire Resistance Rated Assemblies: For fire resistance rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- B. Single Source Responsibility:
 - 1. Framing Members: Obtain steel framing members from single manufacturer.
 - 2. Panel Products: Obtain each type of gypsum board and other panel products from single manufacturer.
 - 3. Finishing Materials: To the extent possible, obtain finishing materials from same manufacturer supplying gypsum board products. When not possible, obtain materials from manufacturer acceptable to gypsum board manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

- B. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.7 WARRANTY

- A. Provide manufacturer's warranty.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1. Steel Studs and Tracks:
 - a. USG Corp. Basis of Design.
 - b. National Gypsum
 - c. United States Gypsum
 - d. ClarkDietrich
 - e. CEMCO; California Expanded Metal Products Co.
 - f. Custom Stud.
 - g. MBA Building Supplies.
 - h. MRI Steel Framing, LLC.
 - i. Phillips Manufacturing Co.
 - j. SCAFCO Steel Stud Co.
 - k. Steel Network, Inc. (The).
 - l. Telling Industries.
 - 2. Ceiling Grid:
 - a. USG Corporation; Drywall Suspension System.
- B. Framing Members:
 - 1. ASTM C754 for component sizes and conditions under specified maximum deflection and lateral loading conditions indicated:
 - a. Steel Sheet Components: Comply with ASTM C645 requirements for metal.
 - b. Protective Coating: ASTM A653/A653M, G60 (Z180), hot dip galvanized.
- C. Steel Framing Components:
 - 1. ASTM C754 for conditions indicated; hot dip galvanize complying with ASTM A653 Z180:
 - a. Steel Studs and Runners: ASTM C645, 0.0179 inch (0.45 mm) minimum base metal thickness; Depth indicated on Drawings.
 - b. Dimpled Steel Studs and Runners: ASTM C645, equivalent to minimum base metal thickness indicated on Drawings for depth indicated on Drawings.
 - c. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
 - d. Cold Rolled Channel Bridging: 0.0538 inch (1.37 mm) bare steel thickness, with minimum 1/2 inch (12.7 mm) wide flanges. Depth indicated on Drawings.
 - e. Clip Angle: Not less than 1-1/2 inches by 1-1/2 inches (38.1 mm by 38.1 mm), 0.068 inch (1.73 mm) thick, galvanized steel.
 - f. Hat Shaped, Rigid Furring Channels: ASTM C645; 0.0179 inch (0.45 mm) minimum base metal thickness; Depth indicated on Drawings.
 - g. Resilient Furring Channels: 1/2 inch (12.7mm) deep, steel sheet members designed to reduce sound transmission. Configuration: Asymmetrical or hat shaped.

- h. Cold Rolled Furring Channels - 0.0538 inch (1.37mm) bare steel thickness, with minimum 1/2 inch (12.7mm) wide flanges:
 - 1) Depth: Indicated on Drawings.
 - 2) Furring Brackets: Adjustable, corrugated edge type of steel sheet with minimum bare steel thickness of 0.0312 inch (0.79 mm).
 - 3) Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch (1.59mm) diameter wire, or double strand of 0.0475 inch (1.21mm) diameter wire.
 - i. Z Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22.2 mm), minimum bare metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.
 - j. Auxiliary Framing Materials: Fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
 - k. Slip Type Head Joints - Where indicated, provide one of the following:
 - 1) Single Long Leg Runner System: ASTM C645 top runner with 2 inch (50.8 mm) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging, located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
 - 2) Double Runner System: ASTM C645 top runners, inside runner with 2 inch (50.8 mm) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 - 3) Deflection Track - Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs. Provide one of the following:
 - a) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
 - b) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
 - c) Superior Metal Trim; Superior Flex Track System (SFT).
 - l. Firestop Tracks:
 - 1) Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire resistance rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs. Provide one of the following:
 - a) Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
 - b) Grace Construction Products; FlameSafe FlowTrak System.
 - c) Metal-Lite, Inc.; The System.
 - d) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series as applicable.
- D. Ceiling Suspension Components:
- 1. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.0625-inch (1.59 mm) diameter wire, or double strand of 0.0475-inch (1.21 mm) diameter wire.
 - 2. Hanger Attachments to Concrete:
 - a. Anchors: Postinstalled, chemical anchor or postinstalled, expansion anchor fabricated from corrosion resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E488 by an independent testing agency.
 - b. Powder Actuated Fasteners: Suitable for application indicated, fabricated from corrosion resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E1190 by an independent testing agency.

3. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12 mm) diameter.
 4. Carrying Channels: Cold rolled, commercial steel sheet with base metal thickness of 0.0538 inch (1.37 mm) and minimum 1/2 inch (12.7 mm) wide flanges. Depth indicated on Drawings.
 5. Furring Channels (Furring Members):
 - a. Cold Rolled Channels: 0.0538 inch (1.37 mm) bare steel thickness, with minimum 1/2 inch (12.7 mm) wide flanges, 3/4 inch (19.1 mm) deep.
 - b. Steel Studs: ASTM C645; minimum base metal thickness of 0.0312 inch (0.79 mm); Depth indicated on Drawings.
 - c. Hat Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch (22.2 mm) deep; Minimum base metal thickness of 0.0312 inch (0.79 mm).
 6. Resilient Furring Channels: 1/2 inch (12.7 mm) deep members designed to reduce sound transmission. Configuration: Hat shaped.
 7. Grid Suspension System for Ceilings: ASTM C645, direct hung system composed of main beams and cross furring members that interlock.
- E. Gypsum Board:
1. ASTM C1396/C1396M, applicable to type of gypsum board indicated and whichever is more stringent:
 - a. Core - Use Type X throughout:
 - 1) Thickness: 5/8 inch (15.9 mm).
 - 2) Long Edges: Tapered and featured (rounded or beveled) for prefilling.
 - b. Ceiling Type - Manufactured for sag resistance:
 - 1) Thickness: 1/2 inch (13mm).
 - 2) Long Edges: Tapered.
 - c. Moisture and Mold Resistant Type - Type X with moisture and mold resistant core and surfaces. Core:
 - 1) Thickness: 5/8 inch (15.9 mm).
 - 2) Long Edges: Tapered.
- F. Impact Resistant Gypsum Board:
1. ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M:
 - a. Core and Thickness: 5/8 inch (15.9 mm), Type X.
 - b. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
 - c. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
 - d. Soft Body Impact: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
 - e. Hard Body Impact: ASTM C1629/C1629M, meets or exceeds Level 1 requirements according to test in Annex A1.
 - f. Long Edges: Tapered.
 - g. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
 - h. Standard gypsum with a fiber mesh embedded in the impact surface.
- G. Acoustically Enhanced Gypsum Board:
1. ASTM C1396/C1396M. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core:
 - a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1) National Gypsum Company.
 - 2) Quiet Solution.
 - b. Core: 1-3/8 inch (35 mm), regular type.
 - c. Long Edges: Tapered.
- H. Reinforced Gypsum Sheathing (Tile Backer Board):

1. ASTM C1278/C1278M, standard edges. Cellulose fiber reinforced panels may be used in lieu of cementitious board:
 - a. Core and Thickness: 1/2 inch (12.7 mm) or 5/8 inch (15.9 mm) to match conditions, Type X.
 - b. Long Edge: Tapered.
 - c. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
- I. Glass Mat Gypsum Sheathing Board:
 1. ASTM C1177/C1177M, with fiberglass mat laminated to both sides and with standard edges:
 - a. Core: Type X
 - b. Thickness: 5/8 inch (15.9 mm).
 - c. Size: 48 inches by 96 inches (1219 mm by 2438 mm).
 - d. Long Edges: Tapered.
- J. Cementitious Backer Units: Refer to 09 30 00 Tile
- K. Exterior Gypsum Board For Ceilings and Soffits:
 1. Glass Mat Gypsum Sheathing Board: ASTM C1177/C1177M, with fiberglass mat laminated to both sides and with standard edges.
 2. Core: 5/8 inch (15.9 mm), Type X.
- L. Water Resistant Gypsum Board
 1. Gold Bond Hi-Abuse XP, by National Gypsum
 2. Gold Bond Hi-Impact, by National Gypsum
 3. Or approved equal
- M. Exterior Trim:
 1. ASTM C1047, hot dip galvanized steel sheet, plastic, or rolled zinc:
 - a. Shapes:
 - 1) Cornerbead.
 - 2) LC Bead: J shaped; exposed long flange receives joint compound.
 - 3) Expansion (Control) Joint: One piece, rolled zinc with V shaped slot and removable strip covering slot opening.
- N. Interior Trim:
 1. ASTM C1047; galvanized or aluminum coated steel sheet, rolled zinc, plastic, or paper faced galvanized steel sheet:
 - a. Shapes:
 - 1) Cornerbead.
 - 2) Bullnose bead.
 - 3) LC Bead: J shaped; exposed long flange receives joint compound.
 - 4) L Bead: L shaped; exposed long flange receives joint compound.
 - 5) U Bead: J shaped; exposed short flange does not receive joint compound.
 - 6) Expansion (control) joint.
 2. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Pittcon Industries.
 - b. Fry Reglet Corp.
 - c. Gordon, Inc.
- O. Continuous Corner:

1. Extruded Aluminum; continuous integral fin for surface contact with gypsum board; 7/8 inch (22 mm) wide, tapered to edge; punched with holes staggered to accept screw fastening. Prime with corrosion resistant primer. Provide Pittcon Softforms (Basis of Design) or Schluter:
 - a. Subject to compliance with requirements, provide basis of design or comparable by one of the following:
 - 1) Pittcon Industries.
 - 2) Fry Reglet Corporation.
 - 3) Schluter.
- P. Joint Treatment - ASTM C475/C475M:
1. Joint Tape:
 - a. Exterior Gypsum Soffit Board: USG Sheetrock Brand Paper Tape.
 - b. Glass Mat Gypsum Sheathing Board Exterior Applications: USG Sheetrock Brand Paper Tape.
 - c. Interior Gypsum Board: USG Sheetrock Brand Paper Tape.
 - d. Cementitious Board: USG Durock Tape.
 2. Joint Compound:
 - a. Gypsum Board – Prefilling - At open joints, rounded or beveled panel edges, and damaged surface areas, use setting type taping compound: USG Sheetrock Brand Easy Sand Setting-Type Joint Compound:
 - 1) Embedding and First Coat - For embedding tape and first coat on joints, fasteners, and trim flanges, use setting type taping compound: USG Sheetrock Brand All Purpose Joint Compound:
 - a) Use setting type compound for installing paper faced metal trim accessories: USG Sheetrock Brand All Purpose Joint Compound.
 - 2) Fill Coat: For second coat, use setting type, sandable topping compound: USG Sheetrock Brand Topping Joint Compound.
 - 3) Finish Coat: For third coat, use setting type, sandable topping compound: USG Sheetrock Brand Topping Joint Compound.
 - 4) Skim Coat: For final coat of Level 4 finish, use setting type, sandable topping compound: USG Sheetrock Brand Topping Joint Compound.
 - b. Cementitious Units: USG Sheetrock Brand Easy Sand Setting-Type Joint Compound.
 - c. Tile Backing Panels: USG Sheetrock Brand Easy Sand Setting-Type Joint Compound.
 - d. Water Resistant Gypsum Backing Board: Use setting type taping compound and setting-type, sandable topping compound: USG Sheetrock Brand Easy Sand Setting-Type Joint Compound.
 - e. Glass Mat Sheathing Board: USG Sheetrock Brand Easy Sand Setting-Type Joint Compound.
- Q. Auxiliary Gypsum Materials:
1. Comply with referenced installation standards and manufacturer's written recommendations:
 - a. Steel Drill Screws: ASTM C1002, use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 - b. Sound Attenuation Blankets:
 - 1) ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool:
 - a) Fire Resistance Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 - c. Acoustical Sealant:

- 1) Nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90:
 - a) USG Corporation; Sheetrock Brand Acoustical Sealant.
- R. Anchors, Clips, and Fasteners:
1. Steel shapes and clips: ASTM A36/A36M, zinc coated by hot dip process according to ASTM A123/A123M.
 2. Expansion anchors: Fabricated from corrosion resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488 conducted by a qualified testing agency.
 3. Power actuated anchors: Fastener system of type suitable for application indicated, fabricated from corrosion resistant materials, with allowable load capacities calculated, greater than or equal to the design load, as determined by testing per ASTM E1190 conducted by a qualified testing agency.
 4. Mechanical fasteners:
 - a. ASTM C1513, corrosion resistant coated, self-drilling, self-tapping, steel drill screws:
 - 1) Head type: Low profile head beneath sheathing.
 5. Welding electrodes: Comply with AWS standards.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Limitations:
 1. Comply with ASTM C840 for gypsum board manufacturer's written instructions, whichever are more stringent:
 - a. Do not install paper faced gypsum panels until installation areas are enclosed and conditioned.
- B. Room Temperatures: Maintain minimum 40 degrees F (4 degrees C). For adhesive attachment and finishing of gypsum board, maintain minimum 50 degrees F (10 degrees C) for 48 hours before application and continuously after until dry. Do not exceed 95 degrees F (35 degrees C) when using temporary heat sources.
- C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.
- D. Do not install panels that are wet, moisture damaged, and mold damaged:
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.
 3. Use screws for installation

3.2 EXAMINATION

- A. Examine areas and substrates including welded hollow metal frames, cast in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.4 INSTALLATION

- A. Installation Standard: ASTM C754, except comply with framing sizes and spacing indicated.
- B. Gypsum Board Assemblies: Comply with requirements in ASTM C840 applicable to framing installation.
- C. Suspension System:
 - 1. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement:
 - a. Suspend hangers from building structure:
 - 1) Install hangers plumb and free from contact with insulation or objects within ceiling plenum that are not part of supporting structural or suspension system. Splay hangers where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2) Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices:
 - a) Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3) Do not attach hangers to steel roof deck.
 - 4) Do not attach hangers to permanent metal forms. Furnish cast in place hanger inserts that extend through forms.
 - 5) Do not attach hangers to rolled in hanger tabs of composite steel floor deck.
 - 6) Do not connect or suspend steel framing from ducts, pipes, or conduit.
 - b. Fire Resistance Rated Assemblies: Wire tie furring channels to supports.
 - c. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.
- D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross furring members to each other and butt cut to fit into wall track.
- E. Framing Assembly:
 - 1. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall:
 - a. Install studs so flanges within framing system point in same direction. Space studs in single layer application as indicated on drawings.
 - b. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing

around ducts penetrating partitions above ceiling:

- 1) Door Openings - Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs:
 - a) Install two studs at each jamb, unless otherwise indicated.
 - b) Install cripple studs at head adjacent to each jamb stud, with minimum 1/2-inch (12.7mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c) Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 2) Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - c. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.
- F. Sound Insulation: Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- G. Gypsum Panels:
1. Comply with ASTM C840. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged:
 - a. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
 - b. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
 - c. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
 - d. Form control and expansion joints with space between edges of adjoining gypsum panels.
 - e. Cover both faces of support framing with gypsum panels in concealed spaces, except in chases braced internally:
 - 1) Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2) Fit gypsum panels around ducts, pipes, and conduits.
 - 3) Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4-inch to 3/8-inch (6.4 mm to 9.5 mm) wide joints to install sealant.
 - f. Isolate perimeter of gypsum board applied to nonload bearing partitions at structural abutments, except floors. Provide 1/4 inch to 1/2 inch (6.4mm to 12.7mm) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
 - g. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- H. Gypsum Board:

1. Install interior gypsum board where indicated on drawings.
 - a. Single Layer Application:
 - 1) On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2) On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire resistance rated assembly, and minimize end joints. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - 3) Fastening Methods: Apply gypsum panels to supports with steel drill screws.
 - b. Multilayer Application:
 - 1) On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - 2) On Z shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 - 3) Fastening Methods: Fasten base layers and face layers separately to supports with screws.
 - I. Exterior Gypsum Board Soffits:
 1. Apply panels perpendicular to supports, with end joints staggered and located over supports:
 - a. Install with 1/4 inch (6.4 mm) open space where panels abut other construction or structural penetrations.
 - b. Fasten with corrosion-resistant screws.
 - J. Trim Accessories:
 1. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Attach trim according to manufacturer's written instructions:
 - a. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.
 - b. Exterior Trim:
 - 1) Install in the following locations:
 - a) Cornerbead: Use at outside corners.
 - b) LC Bead: Use at exposed panel edges.
 - c. Interior Trim - Install in the following locations:
 - 1) Cornerbead: Use at outside corners, unless otherwise indicated.
 - 2) Bullnose Bead: Use at outside corners.
 - 3) LC Bead: Use at exposed panel edges.
 - 4) L Bead: Use where indicated or necessary.
 - 5) U Bead: Use at exposed panel edges.
 - K. Gypsum Board Finishing:
 1. Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces:
 - a. Prefill open joints, rounded or beveled edges, and damaged surface areas.
 - b. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
 - c. Gypsum Board Finish Levels - Finish panels to levels indicated below and
-

according to ASTM C840:

- 1) Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2) Level 2: Panels that are substrate for tile.
 - 3) Level 3: Surfaces be coated with drywall primer prior to final finishes. Heavy or medium texture finishes before final painting, or where heavy-grade wall coverings are to be applied as the final decoration. This level of finish is not recommended where smooth painted surfaces, or light to medium weight wall coverings as specified.
 - 4) Level 4: For surfaces receiving wall covering and flat paints.
New Construction: Drywall to be a Level 4 with orange peel finish.
 - 5) Level 5: For surfaces receiving gloss or semigloss paint and surfaces subjected to severe lighting. To be used in Kitchen areas and food service areas only.
- d. Glass Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
 - e. Glass Mat Faced Panels: Finish according to manufacturer's written instructions.
 - f. Renovation: Review existing finishes and indicate match existing. Advise and provide recommendations to District if existing finish does not match Level 4 with orange peel finish, or if there are a mix of finishes for District review.
- L. Installation Tolerances:
1. Suspension System: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.
 2. Installation Tolerances, Suspension System: Install suspension systems level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged:
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 21 16

SECTION 09 24 23 CEMENT PLASTER AND METAL LATH

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Plaster Information Bureau <http://www.tsib.org/aboutus.shtml>.
- C. Related DSA IR.

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Exterior plasterwork (stucco).
 - 2. Metal framing and accessories.
 - 3. Metal lath and furring.
 - 4. Accessories necessary for a complete installation.
- B. Related Sections:
 - 1. Section 01 45 24: Environmental Import Materials Testing
 - 2. Section 04 22 00: Concrete Unit Masonry
 - 3. Section 05 50 00: Metal Fabrications.
 - 4. Section 06 10 00: Rough Carpentry.
 - 5. Section 07 60 00: Flashing and Sheet Metal
 - 6. Section 07 92 00: Joint Sealants.
 - 7. Section 09 21 16: Gypsum Board Assemblies.
 - 8. Section 09 90 00: Painting and Coating.

1.3 SUBMITTALS

- A. Product Data: Submit technical data for product and accessory, including construction details and material descriptions.
- B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.
- C. Provide a two-foot square sample of each texture to be used.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Building Code:
 - a. Comply with applicable provisions of the California Building Code (CBC) (CCR Title 24, Part 2, as adopted and amended by DSA):
 - 1) CBC, 2507.3 Attachment requirements.
 - 2. Fire Resistance Ratings: Where indicated, provide cement plaster assemblies identical to those of assemblies tested for fire resistance according to ASTM E119 by a qualified testing agency.
- B. Pre-installation Conference: Conduct conference at site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cementitious materials in original packages, containers, or bundles, labeled with manufacturer's name, product brand name, and lot number.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, moisture, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.6 MOCK-UP:

- A. Provide a mock-up only if the texture is not a standard plaster texture or if the pattern is complex.

1.7 WARRANTY

- A. Provide manufacturer's warranty.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturers are subject to compliance with requirements; provide products of one of the following:
 - 1. Metal Lath and Accessories:
 - a. Alabama Metal Industries.
 - b. CEMCO.
 - c. ClarkDietrich Building Systems.
 - d. Marino/WARE.
 - e. Phillips Manufacturing.
 - 2. Wire Fabric Lath:
 - a. Davis Wire.
 - b. Jaenson Wire Company.
 - c. Keystone Steel and Wire Co.
 - d. K-Lath.
 - 3. Plastic Accessories:
 - a. Alabama Metal Industries.
 - b. Phillips manufacturing.
 - c. Plastic Components.
 - d. Vinyl Corp.
 - 4. Ready Mixed Finish Coat Plaster:
 - a. Omega Products International.
 - b. California Stucco Product.
 - c. El Rey Solutions.
 - d. Florida Stucco.
 - e. Quikrete.
 - f. Shamrock Stucco.
 - 5. Acrylic Based Finish Coat:
 - a. California Stucco Product.
 - b. Dryvit Systems.
 - c. El Rey Solutions.
 - d. Finestone, BASF Corp.
 - e. Omega Products International.

- f. Senergy, BASF Corp.
 - g. Sto Corp.
- B. Wood Framing: Refer to Section 06 10 00 Rough Carpentry and 09 21 16 for Gypsum Board Assemblies framing for exterior plaster.
- C. Steel Studs and Runners: Refer to Section 09 21 16 Gypsum Board Assemblies for steel partition framing for interior plaster.
- D. Soffit Framing: Refer to Sections 09 21 16 Gypsum Board Assemblies.
- E. Metal Lath:
 - 1. Expanded Metal Lath:
 - a. ASTM C847, cold rolled carbon steel sheet with ASTM A653/A653M, G60 (Z180), hot dip galvanized zinc coating:
 - 1) Diamond Mesh Lath: Self furring, 3.4 lb/sq. ft. expanded metal lath.
 - 2) Comply with DSA IR 25-4 for the installation of Self-Furring Metal Lath.
 - 3) Chicken wire is not allowed.
 - 2. Paper Backing:
 - a. FS UU-B-790a, Type I, Grade D, Style 1a vapor retardant paper:
 - 1) Provide paper backed lath at exterior locations.
 - 3. Building Wrap:
 - a. Spun-bounded high density polyethylene fibers. No binders or fillers. As manufactured by: Dupont Tyvek Commercial Type D Building Wrap or approved equal. Install per manufacturer's instructions (Installation to meet CBC 2510.6). Provide two layers of the type D.
- F. Accessories: Use galvanized, standard plaster accessories.
 - 1. Comply with ASTM C1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required:
 - a. Metal Accessories:
 - 1) Foundation Weep Screed: Fabricated from hot dip galvanized steel sheet, ASTM A653/A653M, G60 (Z180) zinc coating. Install weep screeds at base of walls.
 - 2) Cornerite: Fabricated from metal lath with ASTM A653/A653M, G60 (Z180), hot dip galvanized-zinc coating.
 - 3) Outside Corner Reinforcement: Fabricated from metal lath with ASTM A653/A653M, G60 (Z180), hot dip galvanized zinc coating.
 - 4) Cornerbeads - Fabricated from zinc or zinc coated (galvanized) steel:
 - a) Smallnose cornerbead with expanded flanges; use unless otherwise indicated.
 - b) Smallnose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing unit masonry corners.
 - 5) Casing Beads: Fabricated from zinc or zinc coated (galvanized) steel; square edged style; with expanded flanges.
 - 6) Control Joints: Fabricated from zinc or zinc coated (galvanized) steel; one piece type, folded pair of unperforated screeds in M shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
 - 7) Expansion Joints: Fabricated from zinc or zinc coated (galvanized) steel; folded pair of unperforated screeds in M shaped configuration; with expanded flanges.
 - 8) Two Piece Expansion Joints: Fabricated from zinc or zinc coated (galvanized) steel; formed to produce slip joint and square edged reveal

- adjustable from 1/4 to 5/8-inch (6 to 16 mm) wide; with perforated flanges.
- b. Plastic Accessories - Manufactured from high impact PVC:
 - 1) Cornerbeads - With perforated flanges:
 - a) Smallnose cornerbead; use unless otherwise indicated.
 - b) Bullnose cornerbead, radius 3/4 inch (19 mm) minimum; use at locations indicated on Drawings.
 - 2) Casing Beads - With perforated flanges in depth required to suit plaster bases indicated and flange length required to suit applications indicated:
 - a) Square edge style, unless otherwise indicated.
 - b) Bullnose style, radius 3/4 inch (19 mm) minimum; use at locations indicated on Drawings.
 - 3) Control Joints: One piece type, folded pair of unperforated screeds in M shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
 - 4) Expansion Joints: Two piece type, formed to produce slip joint and square edged 1/2 inch (13 mm) wide reveal; with perforated concealed flanges, unless otherwise detailed or noted in Section 07 95 00: Expansion Control.
 - c. Aluminum Reveals and Moldings, where applicable:
 - 1) Manufacturer: Fry Reglet
 - 2) Width: 2 inch
 - 3) Material: Extruded 6063 T5 Aluminum
 - 4) Finish: Kynar - Silver Satin.
 - 5) Provide all required accessories, moldings, and prefabricated intersection/corner transition pieces for a complete installation.
 - d. Aluminum Soffit Vents:
 - 1) Manufacturer: Fry Reglet
 - 2) Width: 3 inch
 - 3) Material: Extruded 6063 T5 Aluminum
 - 4) Finish: Kynar - Silver Satin
 - 5) Provide all required accessories, moldings, and prefabricated intersection/corner transition pieces for a complete installation.
- G. Miscellaneous Materials:
- 1. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
 - 2. Fiber for Base Coat: Alkaline resistant glass or polypropylene fibers, 1/2-inch (13 mm) long, free of contaminants, manufactured for use in cement plaster.
 - 3. Bonding Compound: ASTM C932.
 - 4. Fasteners for Attaching Metal Lath to Substrates: ASTM C1063.
 - 5. Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21 mm) diameter unless otherwise indicated.
 - 6. Building Wrap: Spun-bounded high density polyethylene fibers. No binders or fillers. As manufactured by: Dupont Tyvek Commercial Type D Building Wrap or approved equal. Install per manufacturer's instructions.
 - 7. Sound Attenuation Blankets:
 - a. ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool:
 - 1) Fire Resistance Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- H. Plaster Materials:
- 1. Portland Cement - ASTM C150/C150M, Type I or II:
 - a. Color for Finish Coats: Find sand finish, Match paint color

2. Colorants for Job Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color selected by Architect.
3. Lime: ASTM C206, Type S; or ASTM C207, Type S.
4. Sand Aggregate - ASTM C897:
 - a. Color for Job Mixed Finish Coats: White.
5. Exposed Aggregates for Finish Coats: Match paint color
6. Ready Mixed Finish Coat Plaster:
 - a. Mill mixed portland cement, aggregates, coloring agents, and proprietary ingredients.
 - 1) Color: Selected by Architect.
7. Acrylic Based Finish Coatings:
 - a. Factory mixed acrylic emulsion coating systems formulated with colorfast mineral pigments and fine aggregates; for use over cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic based finishes:
 - 1) Color: Selected by Architect.

2.2 PLASTER MIXES

- A. Comply with ASTM C926 for applications indicated:
 1. Fiber Content: Add fiber to base coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. (0.6 kg of fiber/cu. m) of cementitious materials.
- B. Base Coat Mixes for Use over Metal Lath:
 1. Scratch and brown coats for three coat plasterwork:
 - a. Portland Cement Mix:
 - 1) Scratch Coat: For cementitious material, mix 1-part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - 2) Brown Coat: For cementitious material, mix 1-part portland cement and 3/4 to 1-1/2 parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
- C. Job Mixed Finish Coat Mixes:
 1. Portland Cement Mix: For cementitious materials, mix 1-part portland cement and 3/4 to 1-1/2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.
- D. Factory Prepared Finish Coat Mixes: For ready mixed finish coat plasters or acrylic based finish coatings, comply with manufacturer's written instructions.
- E. Use three coat, scratch, brown, and finish over studs, 7/8-inch.
- F. Use 1/2 thick, adhered brown and finish coat at CMU 1/2-inch.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Comply with applicable requirements of ASTM C926.
- B. Environmental Requirements: Comply with requirements of referenced plaster application standards and recommendations of plaster manufacturer for environmental conditions

before, during, and after plaster application.

- C. Cold Weather Requirements: Provide heat and protection, temporary or permanent, as required to protect each coat of plaster from freezing for at least 24 hours after application. Distribute heat uniformly to prevent concentration of heat on plaster near heat sources; provide deflection or protective screens.
- D. Warm Weather Requirements: Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure plaster as required by climatic and job conditions to prevent dry out during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.
- E. Ventilation: Provide natural or mechanical means of ventilation to properly dry interior spaces after portland cement plaster has cured.
- F. Exterior Plasterwork:
 - 1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
 - 2. Apply plaster when ambient temperature is greater than 40 degrees F (4.4 degrees C).
 - 3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.
- G. Protect contiguous Work from soiling and moisture deterioration caused by plastering. Provide temporary covering and take precautions necessary to minimize spattering of plaster on adjacent Work.
- H. Factory Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

3.2 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Proceed with installation after correcting unsatisfactory conditions.

3.3 PREPARATION

- A. Protect adjacent Work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare smooth, solid substrates for plaster according to ASTM C926.

3.4 INSTALLATION

- A. Metal Lath:
 - 1. Install according to ASTM C1063:
 - a. Partition Framing and Vertical Furring: Flat diamond mesh lath.
 - b. Horizontal Framing: Flat diamond mesh lath.
 - c. Install lath with furring nails.
- B. Accessories:

1. Install according to ASTM C1063 and at locations indicated on Drawings:
 - a. Reinforcement for External (Outside) Corners:
 - 1) Install cornerbead at exterior locations.
 - 2) Install cornerbead at interior locations.
 - b. Control Joints - Locate as approved by Architect for visual effect:
 - 1) As required to delineate plasterwork into areas (panels) of the following maximum sizes:
 - a) Vertical Surfaces: 144 sq. ft. (13.4 sq. m).
 - b) Horizontal and Other Nonvertical Surfaces: 100 sq. ft. (9.3 sq. m).
 - 2) At distances between control joints of not greater than 18 feet (5.5 m) o.c.
 - 3) As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
 - 4) Where control joints occur in surface of construction directly behind plaster.
 - 5) Where plasterwork areas change dimensions, to delineate rectangular shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.5 PLASTER APPLICATION

- A. In all cases, use integrally colored plaster.
- B. Comply with ASTM C926:
 1. Do not deviate more than plus or minus 1/4 inch in 10 feet (6 mm in 3 m) from a true plane in finished plaster surfaces when measured by a 10-foot (3-m) straightedge placed on surface.
 2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
 3. Provide plaster surfaces ready to receive field applied finishes indicated.
- C. Flat Surface Tolerances: Do not deviate more than plus or minus 1/8 inch in 10 feet (3 mm in 3 m) from a true plane in finished plaster surfaces, measured by a 10 foot (3m) straightedge placed at any location on surface.
- D. Walls; Base Coat Mixes for Use over Metal Lath:
 1. For scratch and brown coats, for three coat plasterwork with 7/8 inch (19 mm) total thickness over studs:
 - a. Portland cement mixes.
 2. Where plaster walls terminate at a floor or roof deck, provide a gap for deflection.
 3. Where plaster transitions across different substrates, install a two-part expansion joint.
 4. Use 1/2 thick, adhered brown and finish coat at CMU 1/2-inch.
 5. Where stud wall plaster finish is required to align with CMU finish, use a three coat system with metal lath over the CMU.
- E. Plaster Finish Coats: Apply to provide dash finish.
- F. Acrylic Based Finish Coatings (Contractor Option to Plaster Finish Coat): Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.
- G. Concealed Exterior Plasterwork: Where plaster application is used as a base for adhered finishes, omit finish coat.

3.6 PLASTER REPAIRS

- A. Repair or replace Work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.
- B. Cut, patch, replace, repair, and point up plaster as necessary to accommodate other Work. Repair cracks and indented surfaces. Point up finish plaster surfaces around items that are built into or penetrate plaster surfaces. Repair or replace Work to eliminate blisters, buckles, check cracking, dry outs, efflorescence, excessive pinholes, and similar defects. Repair or replace work as necessary to comply with required visual effects.

3.7 TOLERANCES

- A. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet (3mm in 3 m).
- B. Maximum Variation from True Position: 1/8 inch (3mm).

3.8 CLEANING AND PROTECTION

- A. Remove temporary protection and enclosure of Work after plastering is complete. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.
- B. Remove unused materials, containers, equipment, and plaster debris.
- C. Protect plaster and maintain conditions ensuring finished plaster is without damage or deterioration at time of Substantial Completion.

END OF SECTION 09 24 00

SECTION 09 30 00 TILING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Ceramic mosaic tile.
 - 2. Porcelain tile.
 - 3. Accessories required for indicated installation.
- B. Related Sections:
 - 1. Section 03 30 00: Cast-In-Place Concrete.
 - 2. Section 09 21 16: Gypsum Board Assemblies.
- C. Reference Standards:
 - 1. American National Standards Institute (ANSI).
 - 2. Tile Council of North America (TCNA):
 - a. Reference TCNA method numbers for tile assemblies.
 - 3. Comply with Health Department requirements for tile in food service facilities

1.3 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction:
 - 1. Level Surfaces: Minimum 0.6.
 - 2. Ramp Surfaces: Minimum 0.8.
- B. Ceramic Tile Flooring should be stable, firm, and slip resistant, pursuant to CBC Section 11B-302.1.

1.4 SUBMITTALS

- A. Product Data: Technical data including data sheets, installation recommendation, and recommended joint widths.
- B. Shop Drawings - Show locations of each type of tile and tile pattern:
 - 1. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples - Submit samples showing full range of color and texture variations expected:
 - 1. Full size units of each type and composition of tile and for each color and finish required.
 - 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required; minimum 12 inches (300 mm) square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed work.
 - 3. Waterproof membrane in 6 x 6-inch sample.
 - 4. Thresholds in 6 inch (150 mm) lengths.

- D. Test Reports: Submit test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of tile products with requirements for slip resistance.
- E. Maintenance Instructions: Submit maintenance instructions for each type of product specified.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Building Code: Comply with applicable requirements for the CBC for interior finishes.
 - 2. Surface Burning Characteristics - ASTM E84; identify products with appropriate markings of applicable testing agency:
 - a. Flame Spread Index: 25 or less.
 - b. Smoke Developed Index: 450 or less.
 - 3. Accessibility Requirements - Comply with applicable requirements:
 - a. Americans with Disabilities Act of 1990, as amended:
 - 1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design
 - b. 2022 California Building Code (CBC) (CCR Title 24, Part 2, as adopted and amended by DSA):
 - 1) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
- B. Source Limitations for Tile: Obtain tile of same type and color or finish from one source or producer. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- D. Source Limitations for Other Products:
 - 1. Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:
 - a. Stone thresholds.
 - b. Waterproofing.
 - c. Joint sealants.
 - d. Metal edge strips.
- E. Mockups:
 - 1. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
 - a. Build mockup of each type of floor tile installation.
 - b. Build mockup of each type of wall tile installation.
 - c. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

- A. Warrant the work specified, including backer boards but not limited to, for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials or workmanship.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided. Store liquid materials in unopened containers and protected from freezing.
- C. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 EXTRA STOCK

- A. Provide minimum 2 percent of field tile and 5 percent of trims, shapes and accent tiles.

PART 2 PRODUCTS

2.1 MATERIALS

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated. Provide tile complying with Standard grade requirements.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting - For factory mounted tile, provide back or edge mounted tile assemblies as standard with manufacturer unless otherwise indicated:
 - 1. Where tile is indicated for installation on exteriors or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.2 TILE PRODUCTS

- A. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1. Tile:
 - a. Daltile. <http://www.daltile.com/> (Basis of Design)
 - b. Crossville, Inc. <http://www.crossvilleinc.com/>
 - c. Or approved equal.
- B. Floor Tile - Unglazed porcelain mosaics tile with through color:
 - 1. Finish: Matte
 - 2. Module Size: 2 inches, square.
 - 3. Thickness: 1/4 inch

4. Colors: Suede Gray Speckle – D208 (CTF)
 5. Tile Trims and Shapes: Select tile that has the required trim in matching colors.
 6. Borders and Patterns: Moderate complexity patterns as noted on drawings and confirmed by Architect. Allow for angles and cutting of tiles.
 7. Grout Color: Selected by Architect unless noted otherwise.
 8. Wall cove base: 6 inch high cove base tile 3/8" min radius
 - a. Color: Same as
- C. Wall Tile: Ceramic Wall Tile - Glazed tile: Tile to 9 feet high unless noted otherwise.
1. Composition: Impervious natural clay tile.
 2. Module Size: 4 1/4 inches, square.
 3. Thickness: 5/16 inch (8 mm).
 4. Face: Plain with cushion edges.
 5. Surface: Semi-gloss
 6. Base: Six (6) inch high x Six (6) inch wide ceramic tile cove base to match wall tile. 3/8" min radius
 7. Tile Color and Pattern:

CT1: Arctic White - 0190

CT2: Sea Breeze - 1174

CT3: Mustard - 1012
 8. Grout Color: Selected by Architect unless noted otherwise.
 9. Trim Units - Coordinated with sizes and coursing of adjoining flat tile where applicable matching characteristics of adjoining flat tile. Provide shapes selected from standard shapes:
 - a. Provide bullnose top edge trim. Tile Trims and Shapes: Select tile that has the required trim in matching colors.
 - b. Wainscot Cap for Thinset Mortar Installations: Surface bullnose, module size 1 inch by 1 inch (25.4 mm by 25.4 mm) or 2 inch by 1 inch (50.8 mm by 25.4 mm) or 2 inch by 2 inches (50.8 mm by 50.8 mm).
 - c. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it, same size as adjoining flat tile.
 - d. External Corners for Thinset Mortar Installations: Surface bullnose, module size 1 inch by 1 inch (25.4 mm by 25.4 mm) or 2 inch by 1 inch (50.8 mm by 25.4 mm) or 2 inch by 2 inches (50.8 mm by 50.8 mm).
 - e. Internal Corners: Cove, module size 1 inch by 1 inch (25.4 mm by 25.4 mm) or 2 inches by 1 inch (50.8 mm by 25.4 mm).
 - f. Internal Corners: Field-buttet square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.
 - g. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch (12.7 to 6.4 mm) across nominal 4 inch (100 mm) dimension.
- D. Threshold - Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes:
1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/4 inch (6.35 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.
 2. Marble Thresholds - ASTM C615/C615M, with honed finish:
 - a. Description: Uniform, medium grained, white stone without veining.
 - b. Manufacturer: Daltile:
 - c. Finish: Polished
 - d. Size: 2" w X door length x 3/8" d
 - e. Color: From manufacturers standard colors

2.3 WATERPROOF MEMBRANE

- A. Waterproof membrane recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fluid Applied Membrane - Liquid latex rubber or elastomeric polymer:
 - 1. Basis of Design - **Laticrete 9235 Waterproofing Membrane**:
 - a. Subject to compliance with requirements, provide basis if design or comparable product by one of the following:
 - 1) Laticrete International, Inc.
 - 2) MAPEI Corporation.
 - 3) TEC; H.B. Fuller Construction Products Inc.
- C. Fabric Reinforced, Fluid Applied Membrane:
 - 1. System consisting of liquid latex rubber or elastomeric polymer and continuous fabric reinforcement.
 - a. Basis of Design - **Laticrete 9235 Waterproofing Membrane** and reinforcing Fabric. Subject to compliance with requirements, provide basis if design or comparable product by one of the following:
 - 1) Laticrete International, Inc.
 - 2) MAPEI Corporation.
 - 3) Merkrete by Parex USA, Inc.
- D. Latex Portland Cement Waterproof Mortar:
 - 1. Flexible, waterproof mortar consisting of cement based mix and latex additive:
 - a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1) C-Cure.
 - 2) MAPEI Corporation.
 - 3) TEC; H.B. Fuller Construction Products Inc.
- E. Liquid Latex Waterproofing/Crack Isolation Membrane:
 - 1. Single Component, self-curing, load bearing liquid rubber polymer that forms a flexible seamless combined waterproofing membrane and crack isolation membrane:
 - a. Basis of Design - **Hydroban by Laticrete International**. Subject to compliance with requirements, provide basis of design or comparable product by one of the following:
 - 1) Laticrete International, Inc.
 - 2) MAPEI Corporation.
 - 3) TEC; H.B. Fuller Construction Products Inc.

2.4 CRACK ISOLATION MEMBRANE

- A. Crack isolation membrane for standard performance and recommended by manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric Reinforced, Modified Bituminous Sheet – Self-adhering, modified bituminous sheet with fabric reinforcement facing; 0.040-inch (1 mm) nominal thickness:
 - 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Custom Building Products.
 - b. MAPEI Corporation.

- C. Fluid Applied Membrane - Liquid latex rubber or elastomeric polymer:
 - 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. Merkrete by Parex USA, Inc.
 - e. TEC; H.B. Fuller Construction Products Inc.
- D. Fabric Reinforced, Fluid Applied Membrane - System consisting of liquid latex rubber or elastomeric polymer and fabric reinforcement:
 - 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Bonsal American, an Oldcastle company.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. Merkrete by Parex USA, Inc.

2.5 SETTING MATERIALS

- A. Dry Set Mortar (Thinset):
 - 1. Mortar Bed - Proportions of 1 part Portland Cement to 5 parts sand:
 - a. Portland Cement: ASTM C150, Type 1.
 - b. Sand: ASTM C144.
 - c. Water: Potable.
 - 2. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - 3. Wall Applications: Provide mortar complying with requirements for non-sagging mortar.
- B. Modified Dry Set Mortar (Thinset):
 - 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. TEC; H.B. Fuller Construction Products Inc.
 - 2. Provide prepackaged, dry mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid latex additive at site.
 - 3. Wall Applications: Provide mortar complying with requirements for non-sagging mortar.
- C. Improved Modified Dry Set Mortar (Thinset):
 - 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. TEC; H.B. Fuller Construction Products Inc.
 - 2. Provide prepackaged, dry mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid latex additive at Project site.
 - 3. For wall applications, provide mortar complying with requirements for non-sagging

mortar.

- D. Portland Cement Mortar (Thickset) Installation Materials:
 - 1. Mortar Bed - Proportions of 1 part Portland Cement to 5 parts sand:
 - a. Portland Cement: ASTM C150, Type 1.
 - b. Sand: ASTM C144.
 - c. Water: Potable.
 - 2. Cleavage Membrane: Asphalt felt, ASTM D226/D226M, Type I (No. 15); or polyethylene sheeting, ASTM D4397, 4.0 mils (0.1 mm) thick.
 - 3. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, 2 by 2 inches (50.8 by 50.8 mm) by 0.062-inch (1.57 mm) diameter; comply with ASTM, except for minimum wire size.
 - 4. Expanded Metal Lath - Diamond mesh lath complying with ASTM C847:
 - a. Base Metal and Finish for Interior Applications: Uncoated or zinc-coated (galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.
 - b. Base Metal and Finish for Exterior Applications: Zinc coated (galvanized) steel sheet.
 - c. Configuration over Studs and Furring: Flat.
 - d. Configuration over Solid Surfaces: Self furring.
 - e. Weight: 3.4 lb/sq. yd. (1.8 kg/sq. m).
 - 5. Latex Additive: Styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex additive manufacturer for use with field mixed Portland cement and aggregate mortar bed.
- E. Tile Setting Epoxy - Water cleanable; 100 percent solids epoxy grout:
 - 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Polyblend Tile Grout with 100% Solids Epoxy; Custom Building Products.
 - b. SpectraLOCK PRO Stainless Grout; Laticrete International, Inc.
 - 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 degrees F and 212 degrees F (60 degrees C and 100 degrees C), respectively, and certified by manufacturer for intended use.
 - 3. Color: Selected by Architect.

2.6 GROUT MATERIALS

- A. Water Cleanable Epoxy Grout:
 - 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Polyblend Tile Grout with 100% Solids Epoxy; Custom Building Products.
 - b. SpectraLOCK PRO Stainless Grout; Laticrete International, Inc.
 - c. MAPEI Corp., Kerapoxy or Kerapoxy CQ Epoxy Grout.
 - 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 degrees F and 212 degrees F (60 degrees and 100 degrees C), respectively, and certified by manufacturer for intended use.
 - 3. Floors: Floors: sanded 1/8 inch dark colored cementitious grout.
 - 4. Walls: Walls: sanded 1/8 inch light colored cementitious grout.
 - 5. Grout to be sealed by installer 3 days after installation.

2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex modified, Portland cement-based formulation provided or approved by manufacturer of tile setting materials for

installations indicated.

- B. Vapor Retarder Membrane: Polyethylene sheeting, ASTM D4397, 4.0 mils (0.1 mm) thick.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- D. Tile and Grout Sealer - Sealer for sealing grout joints and that does not change color or appearance of grout:
 - 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Custom Building Products.
 - b. Summitville Tiles, Inc.
 - c. TEC; H.B. Fuller Construction Products Inc.
- E. Sealant - Silicone sealant; refer to Section 07 92 00:
 - 1. Top of Wainscot: Bullnose

2.8 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

2.9 TILE BACKING BOARD (WALLS ONLY)

- A. Manufacturers:
 - 1. Georgia-Pacific Corp <http://www.gp.com>
 - 2. United States Gypsum <http://www.usg.com/index.html>
 - 3. Or approved equal
- B. Products:
 - 1. Cementitious backer board
 - 2. Dens-Shield Tile Backer
 - 3. USG Mold Tough
 - 4. USG Durock
- C. Cementitious Backer Units: ANSI A108.11; install where indicated with 1/4-inch (6.4 mm) gap where panels abut other construction or penetrations. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.
- B. Contractor is required to achieve the specified concrete moisture content prior to installation of all flooring materials or use a flooring manufacture approved moisture barrier prior to installation of all flooring products.
- C. Maintain temperatures at 50 degrees F or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

3.2 EXTRA MATERIALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents:
 - 1. Tile and Trim Units: Furnish quantity of full size units equal to 2 percent of field tile and 5 percent of amount installed trims, accent tiles, and shapes, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 2 percent of amount installed for each type, composition, and color indicated.

3.3 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed for compliance with requirements for installation tolerances and other conditions affecting performance of the work:
 - 1. Verify substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108 for installations indicated.
 - 2. Verify concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108 for installations indicated:
 - a. Verify surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation after correcting unsatisfactory conditions.

3.4 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108 and is sloped 1/4 inch per foot (1:50) toward drains.

- C. Blending: For tile exhibiting color variations, verify tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at site before installing.

3.5 INSTALLATION

- A. Comply with TCNA *Handbook for Ceramic, Glass, and Stone Tile Installation* for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series *Specifications for Installation of Ceramic Tile* that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used:
 - 1. For the following installations, comply with ANSI A108 series procedures for tile installation standards for providing 95 percent mortar coverage:
 - a. Exterior tile floors.
 - b. Tile floors in wet areas.
 - c. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.
 - d. Tile floors consisting of rib-backed tiles.
- B. Grout:
 - 1. Floor: 100 percent solid epoxy grout.
 - 2. Walls: Non-sanded grout.
 - 3. Grout to be sealed 28 days after installation.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Provide trim shapes where necessary to eliminate exposed tile edges.
- F. Where accent tile differs in thickness from field tile, vary setting bed thickness so tiles are flush.
- G. Jointing Pattern:
 - 1. Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated:
 - a. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - b. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - c. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- H. Joint Widths - Unless otherwise indicated, install tile with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/8 inch (3.2 mm).
 - 2. Porcelain Tile: 1/4 inch (6.4 mm)

- I. Lay out tile wainscots to dimensions indicated.
- J. Expansion Joints:
 - 1. Provide expansion joints and sealant filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installing tiles:
 - a. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- K. Thresholds:
 - 1. Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated:
 - a. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in improved modified dry set mortar (thinset).
 - b. Do not extend cleavage membrane waterproofing or crack isolation membrane under thresholds set in standard dry set, modified dry set or improved modified dry set mortar. Fill joints between such thresholds and adjoining tile set on cleavage membrane, waterproofing, or crack isolation membrane with elastomeric sealant.
- L. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile and no threshold is indicated.
- M. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
- N. Waterproofing:
 - 1. Install waterproofing to manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate:
 - a. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.
- O. Crack Isolation Membrane:
 - 1. Install crack isolation membrane to comply with manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate:
 - a. Allow crack isolation membrane to cure before installing tile or setting materials over it.
- P. Floor Tile - Install tile to comply with requirements in the TCNA installation methods and ANSI A108 series of tile installation standards:
 - 1. Back Buttering - For installations indicated, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
 - a. Tile floors in wet areas, including showers.
 - b. Tile floors composed of rib backed tiles.
 - 2. Tile Installation Method:
 - a. Interior Floor Installations, Concrete Subfloor:
 - 1) TCNA F121; cement mortar bed (thickset) on waterproof membrane.
 - 2) TCNA F122; thinset mortar on waterproof membrane.
 - b. Interior Floor Installations, Wood Subfloor:
 - 1) TCNA F144; thinset mortar on waterproof membrane on cementitious backer.
- Q. Wall Tile Installation:
 - 1. Install types of tile designated for wall installations to comply with requirements,

including those referencing TCNA installation methods and ANSI setting bed standards:

- a. Back Buttering - For installations indicated, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
 - 1) Tile wall installations in wet areas, including showers.
 - 2) Tile installed with chemical resistant mortars and grouts.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning - On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter:
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 09 30 00

SECTION 09 50 00 ACOUSTICAL CEILING PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Acoustical panels.
 - 2. Concealed and exposed suspension systems for ceilings.
 - 3. Ceiling panel for food service area.
 - 4. Accessories necessary for a complete installation.

1.3 SUBMITTALS

- A. Product Data: Technical data for each product including installation instructions.
- B. Samples:
 - 1. Acoustic Panel: Set of 6 inch (150 mm) square samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12 inch (300 mm) long samples of each type, finish, and color.
- C. Coordination Drawings:
 - 1. Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - a. Suspended ceiling components.
 - b. Structural members to which suspension systems will be attached.
 - c. Size and location of initial access modules for acoustical panels.
 - d. Items penetrating finished ceiling including but not limited to the following:
 - 1) Lighting fixtures.
 - 2) Air outlets and inlets.
 - 3) Speakers.
 - 4) Access panels.
 - e. Perimeter moldings.
- D. Maintenance Data: Manufacturer data for finishes for inclusion in maintenance manuals.
- E. Submit one copy of ICC-ES Reports.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Building Code:
 - a. Comply with applicable requirements of the CBC for interior finishes:
 - 1) DSA Interpretation of Regulations – IR 25-2.13 Metal Suspension Systems for Lay-in Panel Ceilings.
 - 2) CBC - 2022 California Building Code.

- 3) Chapter 19, 2022 California Building Code.
 - 4) Chapter 23, 2022 California Building Code.
 - 5) Acoustical Panel Standard: ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance:
 - a) Mounting Method for Measuring NRC: Plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface according to ASTM E 795.
 2. Surface Burning Characteristics:
 - a. Ceiling panels with surface burning characteristics complying with CBC and ASTM E 1264 for Class A materials determined by testing identical products in accordance with ASTM E 84:
 - 1) Flame Spread Index: 25 or less.
 - 2) Smoke Developed Index: 450 or less.
 3. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 4. Fire Resistance Ratings: Comply with ASTM E 119; testing by qualified testing agency. Identify products with appropriate markings of applicable testing agency. Indicate design designations from UL *Fire Resistance Directory* or from the listings of another qualified testing agency.
- B. Source Limitations:
1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
 2. Suspension System: Obtain each type through one source from a single manufacturer.
- C. Comply with applicable regulations regarding toxic and hazardous materials:
1. Coating Based Antimicrobial Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment; and showing no mold or mildew growth when tested in accordance with ASTM D3273.
 2. Panel Based Antimicrobial Treatment: Provide acoustical panels manufactured with antimicrobial treatment in the panels.
- D. Pre-installation Conference: Conduct conference at site.

1.5 WARRANTY

- A. Standard Ceiling Panels: Warrant ceiling panels to be free from sagging, warping, shrinking, buckling, or delaminating as a result of manufacturing defects for a period of one (1) year from the date of Substantial Completion.
- B. Sag Resistant Ceiling Panels: warrant products to be free from sagging, warping, shrinking, buckling, or delaminating as a result of manufacturing defects for a period of ten (10) years from the date of Substantial Completion. Provide warranty foe against mold, mildew, and bacterial growth on panels.
- C. Standard Suspension System: Suspension systems shall be warranted to be free from defects in material or factory workmanship and shall not incur 50 percent red rust as defined by ASTM B117 test procedures for a period of ten (10) years from the date of Substantial Completion.
- D. Suspension system / ceiling panels: Provide manufacturers standard 15 year warranty for suspension systems when used in combination with same manufacturers sag resistant ceiling panels. Ceiling panels to be free from sagging, warping, shrinking, buckling, or

delaminating as a result of manufacturing defects. Suspension systems shall not incur 50 percent red rust as defined by ASTM B117 test during the period of the warranty, extra materials.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to site in original, unopened packages and store in a fully enclosed, conditioned space protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, allow panels to attain room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 EXTRA STOCK

- A. Provide no less than 5 percent of the number of tiles required for the Work.

1.8 PRE INSTALLATION MEETING

- A. Schedule a pre-installation meeting with Architect, Owner's Representative, and General Contractor in attendance.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturers are subject to compliance with requirements; provide ceiling panels and grid systems by one of the following:
 - 1. Concealed and Exposed Suspension Grid:
 - a. USG Interiors (Basis of Design 1)
 - b. Armstrong World Industries, Inc. (Basis of Design 2)
 - c. CertainTeed Corporation (subject to DSA approval)
 - d. United States Gypsum (subject to DSA approval)
 - e. Grid Note: If contractor deviates from basis of design 1 or 2 during construction, it requires DSA approval prior to installation.
 - 2. Acoustical Ceiling Panel:
 - a. USG Interiors (Basis of Design)
 - b. Armstrong World Industries, Inc.
 - c. CertainTeed Corporation.
 - 3. Molding and Edge Trim:
 - a. USG Interiors, Inc.; Subsidiary of USG Corporation.
 - b. Armstrong World Industries, Inc.
 - c. Chicago Metallic Corporation.
 - d. Fry Reglet Corporation.
 - 4. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
 - 5. Acoustical Sealant for Concealed Joints:
 - a. Henkel Corporation; OSI Pro-Series SC-175 Acoustical Sound Sealant.
 - b. Pecora Corporation; AIS-919.

- B. Acoustical Panel Colors and Patterns:
1. Match appearance characteristics indicated for each product type:
 - a. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.2 METAL SUSPENSION SYSTEM

- A. Metal Suspension System: Direct hung metal suspension systems of types, structural classifications, and finishes indicated complying with applicable requirements in ASTM C 635/C 635M. If contractor deviates from basis of design during construction, it requires DSA approval prior to installation.
1. Products of following manufacturers form basis for design and quality intended.
 - a. Armstrong World Industries. Lancaster, PA. Products: Prelude XL, 15/16 inch Exposed Tee. Contact: Eric Hartzheim, Tel. 949.629.0306, Email enhartzheim@armstrong.com.
 - b. USG Interiors. Chicago, IL Products DX/DXL 15/16 inch Exposed Tee Contact: Travis Dunville, Tel. 626.818.6660, Email tdunville@usg.com
 2. High Humidity Finish: Comply with ASTM C 635/C 635M requirements for *Coating Classification for Severe Environment Performance* where high humidity finishes are indicated.
 3. Grid and Metal Suspension System: ASTM C635, Armstrong Prelude Heavy Duty XL 15/16" or USG DX/DXL Heavy Duty 15/16" ceiling system, galvanized components die cut and interlocking.
 - a. Main Runners:
 - 1)
 - a) Armstrong: Heavy Duty Prelude XL 7301, exposed T, (heavy duty).
 - b) USG: Heavy Duty DX/DXL DX26, exposed T, (heavy duty).
 - 2) Cross Tees – "Stake-on end", Stepped End:
 - a) Armstrong: XL7328 (24 inch grid), XL7342 (48 inch grid).
 - b) USG: DX216 (24 inch grid), DX422 (48 inch grid).
 - 3) Edge Trim and accessories:
 - a) Armstrong Molding: 7877, 15/16" Shadow molding, 1/4" reveal.
 - USG Molding: M7 7/8" x 7/8" Wall molding
 - b) BERC2 2" Retention Clips (Steel) or USG ACM7 Seismic Clip
 - c) SJCG: Seismic Joint Clip CT (PeakForm) or DH2 Seismic Separation Joint Clip
 - d) 9/16" Shadow Reveal Transition Molding: #7901.
 - e) 15/16" Shadow Reveal Transition Molding: #7902.
 - 4) Beam End Retention Clip: slide clip for free end of main-runners and cross-tees with 2-inch movement capability.
 - a) Acceptable Product: Armstrong BERC2, USG ACM7, or comparable product
 - 5) Retention Clips: Armstrong #414 Retention Clip or equal. At non-rated ceilings.
 - 6) Accessories: Stabilizer bars, panel stabilizer clips, adapters, splices, edge trim and all necessary components required for the specified suspended grid system.
 - 7) Grid Materials: main runners, cross runners, splices, expansion devices and intersection connectors, commercial quality cold rolled steel with galvanized coating. Designed to carry a mean ultimate test load on not less than 180 lbs. compression tension per ASTM E580 Section 5.1.2. The ceiling grid system must be rated as heavy duty as defined by ASTM C635

- 8) Grid Finish: Prelude XL – factory applied standard white.
USG: DX.DXL – Factory applied standard white
- 9) Hanger Wire: No. 12 gauge wire shall be 0.106 inch in diameter conforming to ASTM A641. No. 12 gage wire shall be soft annealed, galvanized steel wire with a Class 1 zinc coating with a minimum tensile strength = 70 ksi.
- 10) Compression Struts: As detailed in the drawings.
- 11) Techzone Yoke: Armstrong TZYK. Or USG Logix Yoke
- 12) Techzone Bracing Clip: Armstrong TZBC or USG DH3 3-Way Connector.

2.3 ACOUSTICAL PANELS

A. Acoustic Panel Type ACP1:

1. Basis of Design Product: School Zone Fine Fissured No. 1714 by Armstrong World Industries Or Radar High NRC/ High CAC No. 22441 by USG Interiors
2. Classification - Provide panels complying with ASTM E 1264 for type, form, and pattern:
 - a. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
 - b. Pattern: CE (perforated, small holes and lightly textured).
 - c. Tile to be acoustical mineral fiber ceiling panels.
3. Color: White (Fissured)
4. LR: Not less than 85%
5. NRC: Not less than 0.70.
6. STC Range: 30 to 34
7. CAC: Not less than 40.
8. Edge/Joint Detail: Square.
9. Thickness: 5/8 inch (19 mm).
10. Modular Size: 24 by 48 inches
11. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.
12. Typical Location: Primary learning areas, classrooms and offices.

B. Acoustic Panel Type ACP2:

1. Basis of Design Product: Clean Room VL No. 870 by Armstrong World Industries. Or Clean Room Class 100 No. 56091 (Smooth) by USG Interiors
2. Classification - Provide panels complying with ASTM E 1264 for type, form, and pattern:
 - a. Type and Form: Type IV, mineral base with membrane faced overlay; washable vinyl film overlay.
 - b. Pattern: GH (smooth and printed).
 - c. Color: White.
3. LR: Not less than 80%
4. CAC: Not less than 40.
5. Edge/Joint Detail: Square.
6. Thickness: 5/8 inch (15 mm).
7. Modular Size: 24 by 48 inches (610 by 1220 mm).
8. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.
9. Typical Location: Concessions Room

2.4 MOLDING, TRIM AND ACCESSORIES

- A. Shadow Molding: Where an acoustical lay in ceiling abuts a gypsum board ceiling in the same plane, provide a "W" shaped reveal or "shadow" molding similar to Armstrong Shadow Molding No. 7873 or USG Shadow Molding MS144.
- B. Light Fixture Protection:
 - 1. Manufacturer: Thermafiber Light Protection Kit by Owens Corning or Type 5/8 or 3/4 P(S) by Armstrong World Industries.
 - 2. Fire Resistance Rating: Same as ceiling assembly rating.
 - 3. Locations: At fixtures reinstalled in fire rated ceiling assemblies.
- C. Roll Formed, Sheet Metal Edge Moldings and Trim:
 - 1. Type and profile for standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color used for exposed flanges of suspension system runners:
 - a. Provide edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 - b. For lay in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 - c. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- D. Extruded Aluminum Edge Moldings and Trim:
 - 1. Where indicated, provide extruded aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
 - a. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for Alloy and Temper 6063-T5.
 - b. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
 - c. Baked Enamel or Powder Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm). Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
- E. Acoustical Sealant:
 - 1. Comply with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90:
 - a. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
 - b. Concealed Joints: Nondrying, non-hardening, non-skinning, nonstaining, gunnable, synthetic rubber sealant.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Limitations:
 - 1. Do not install acoustical panel ceilings until spaces are enclosed and weatherproof,

wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use:

- a. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

3.2 EXTRA MATERIALS

- A. Furnish extra materials matching products installed and packaged with protective covering for storage and identified with labels describing contents:
 1. Acoustical Ceiling Panels: Full size panels equal to 2 percent of quantity installed.
 2. Suspension System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
 3. Hold-Down Clips: Equal to 2 percent of quantity installed.
 4. Impact Clips: Equal to 2 percent of quantity installed.

3.3 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut for compliance with requirements specified that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation after correcting unsatisfactory conditions.

3.4 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less than half width panels at borders, and comply with layout shown on reflected ceiling plans.

3.5 INSTALLATION

- A. Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA *Ceiling Systems Handbook*:
 1. Fire Rated Assembly: Install fire-rated ceiling systems according to tested fire rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers where required and, if permitted with fire resistance rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 4. Secure wire hangers to ceiling-suspension members and to supports above with a

- minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast in place hanger inserts, post-installed mechanical or adhesive anchors, or power actuated fasteners that extend through forms into concrete.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast in place or post-installed anchors.
- D. Panel Accessibility: Install panels downward accessible by disengaging hinge support rail on one side of panel from the T Bar Flange or optional A Mount rail flange without the use of tools, for access without removal of panel from the ceiling.
- E. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels:
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- F. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- G. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit:
1. Arrange directionally patterned acoustical panels with pattern running in one direction parallel to long axis of space.
 2. For square edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 3. For reveal edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 4. For reveal edged panels on suspension system members with box shaped flanges,

- install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 6. Install hold-down clips in areas indicated, in areas with exterior opening larger than 48" x 96", where required by authorities having jurisdiction, and for fire resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
 7. Install clean room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
 8. Protect lighting fixtures and air ducts to comply with requirements indicated for fire resistance rated assembly.

3.6 FIRE RATING SCHEDULE

- A. Refer to UL Assemblies Drawings for Fire Rating requirements of ceiling materials at rated floor and roof assemblies.

3.7 FIELD QUALITY CONTROL

- A. Special Inspections:
 1. Engage a qualified special inspector to perform the following special inspections:
 - a. Compliance of seismic design.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
- C. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements:
 1. Extent of Each Test Area:
 - a. When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed:
 - 1) Within each test area, testing agency will select one of every 10 power-actuated fasteners and post-installed anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two post-installed anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
 - 2) When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.8 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning

and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 00

SECTION 09 90 00

PAINTING

Part 1 – General

A. Related Sections

1. 03 30 00: Cast in Place Concrete
2. 04 22 00: Concrete Unit Masonry
3. 05 50 00: Metal Fabrications
4. 08 11 13 - Hollow Metal Doors and Frames
5. 08 50 00: Series, Windows
6. 09 21 16: Gypsum Board Assemblies
7. 09 24 23: Cement Plaster and Metal Lath
8. 09 96 23: Graffiti-Resistant Coatings

B. Submittals

1. Installer Certifications – Submit documentation that all Contractors which will impact surfaces coated with lead-based paints (coatings containing lead at 1.0 mg/cm, or greater, if tested by XRF, or 5,000 mg/kg, or greater, if tested by paint chip samples), hold a current Lead Safe Work certification, as required by 40 CFR 745.
2. Paint draw downs of each color and sheen used on the project. Draw down shall include the formula/paint code and the manufacturer on the drawdown.
3. Final schedule of colors and formulas/paint codes for each color and sheen at the end of the project. Schedule shall include the paint manufacturer for each color.

C. Extra Stock

1. One gallon of each color used, clearly marked with manufacturer label and mix design (formula).

Part 2 – Products

A. Manufacturer

1. Dunn Edwards <http://www.dunnedwards.com/>
2. Sherwin Williams <http://www.sherwin-williams.com/>
3. Vista Paint: www.vistapaint.com
4. Or Approved Equal

B. Good flow and brushing properties capable of drying or curing free of streaks, sags, and voids.

C. All paint and primer products shall be low, ultra-low or no VOC.

- D. Accessory Materials: All other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
- E. Finishes:
1. Refer to drawings for finish schedule.
 2. Product numbers listed are as manufactured by Dunn Edwards unless indicated otherwise (equivalent products of other manufacturers listed hereinbefore are also acceptable).
- F. Schedule - Exterior Surfaces - Descriptions in schedule apply to new and previously painted surfaces. Number of coats listed is a minimum, additional coats may be required to achieve full and complete coverage.
1. Ferrous Metal (Semi-Gloss Enamel) Completely re-prime all shop primed items
in field 1st coat – Dunn-Edwards Bloc-Rust Primer BRPR00-1 Series
2nd and 3rd coats – Dunn-Edwards Evershield EVSH50 Semi-Gloss
 2. Metal Deck (underside) and Supporting Structural Steel
Members 1st coat – Dunn-Edwards Bloc-Rust Primer
BRPR00-1 Series
2nd and 3rd coats – Dunn-Edwards Evershield EVSH50 Semi-Gloss
 3. Galvanized Metal Non-Railings (Misc. Galvanized metals, underside of metal
decking, flashings, etc.) (Semi-Gloss Enamel)
1st coat – Metal Clean and Etch SCME-01
2nd coat – Dunn-Edwards Ultragrip Multisurface Primer
UGPR00 3rd and 4th coats – Dunn-Edwards Evershield
EVSH50 Semi-Gloss
 4. Cement Plaster and Exposed Concrete
(Semi-Gloss) 1st coat – Dunn-Edwards Eff-
Stop Select ESSL00
2nd and 3rd – Dunn-Edwards Evershield EVSH50 Semi-Gloss
 5. Wood (Semi-gloss)
1st coat - Dunn-Edwards E-Z Prime Premium EZPR00
2nd and 3rd coats - Dunn-Edwards Evershield EVSH50 Semi-Gloss
 6. New Concrete Block (Semi-Gloss)
1st coat - Dunn-Edwards Blocfil Select SBSL00
2nd and 3rd coats - Dunn-Edwards Evershield EVSH50 Semi-Gloss
 7. Existing Concrete Block (Semi-Gloss)
1st coat – Dunn-Edwards Eff-Stop Select ESSL00

2nd and 3rd coats – Dunn-Edwards Evershield EVSH50 Semi-Gloss

8. Aluminum In-Fill Panels (Submit Variance Request, only consideration if previously painted)

1st coat – Factory Prime coat (Touch up if abraded)

2nd and 3rd coats – Dunn-Edwards Evershield EVSH50 Semi-Gloss

9. Cementitious Siding (Semi-Gloss)

1st coat – Dunn-Edwards Eff-Stop Select ESSL00

2nd and 3rd coats – Dunn-Edwards Evershield EVSH50 Semi-Gloss

- G. Schedule - Interior Surfaces - Descriptions in schedule apply to new and previously painted surfaces. Number of coats listed is a minimum, additional coats may be required to achieve full and complete coverage.

1. New Gypsum Board (Semi-Gloss at Walls, Gloss at Kitchen and Restroom Ceilings, and Flat at other Ceilings, Enamel)

1st and 2nd coats - Dunn-Edwards Vinylastic Select VNSL00

3rd and 4th coats - Dunn-Edwards Evershield EVSH50 Semi-Gloss (for walls)
Dunn- Edwards Evershield EVSH60 (for gloss ceilings), Vista Paints, Duraglide 1000, Flat, White (for flat ceilings)

COLOR: DEC772 NAVAJO WHITE

2. New or Existing Painted Wood (Semi-Gloss Enamel)

1st coat - Dunn-Edwards Interkote Premium IKPR00 or B-I-N Primer-Sealer Stain-Killer if necessary.

2nd and 3rd coats - Dunn-Edwards Evershield EVSH50 Semi-Gloss

3. New Wood to Receive Transparent Finish (Stain and

Lacquer) 1st coat – Dunn Edwards Valpro Sanding
Sealer NAS 2750

2nd and 3rd coats - Dunn Edwards Valpro Satin Lacquer NAF 2752

4. Existing Stained Wood (Varnish

Finish) 1st coat – Minwax Stain

2nd and 3rd coats – Defthane Polyurethane Satin Varnish

5. Existing Stained Wood (Lacquer Finish)

1st coat – Stain to provide uniform finish, match existing tone Valspar Zenith

Stain 2nd and 3rd coats - Dunn Edwards Valpro Satin Lacquer NAF 2752

6. Ferrous Metal (Semi-Gloss Enamel) – Re-prime all shop primed items

in field. 1st coat – Dunn-Edwards BLOC-Rust Premium BRPR00-1
series

2nd and 3rd coats – Dunn-Edwards Evershield EVSH50

Semi-Gloss (Typical paint system at all hollow metal doors and frames)

7. Cement Plaster and Exposed Concrete (Semi-Gloss at Walls, Gloss at Kitchen and Restroom Ceilings, and Flat at Ceilings, Enamel)

1st coat – Dunn-Edwards Ultra Grip Premium UGPR00 series or B-I-N Primer-Sealer Stain-Killer if necessary

2nd and 3rd coats- Dunn-Edwards Evershield EVSH50 Semi-Gloss (for walls)
Dunn- Edwards Evershield EVSH60 (for gloss ceilings) Dunn-Edwards Spartawall Flat SWLL10 (for flat ceilings)

COLOR: DEC772 NAJAVO WHITE

8. Acoustical Ceiling Tiles (Flat)

1st coat – Dunn-Edwards Ultra Grip Premium UGPR00 series or B-I-N Primer-Sealer Stain-Killer.

2nd and 3rd coats - Dunn-Edwards Acoustikote W615

9. Galvanized and Zinc Alloy Metal, (Semi-Gloss Enamel). 1st coat – Metal Clean and Etch SCME-01

2nd coat - Dunn-Edwards Ultra Grip Premium UGPR00 series

3rd and 4th coats – Dunn-Edwards Evershield EVSH50 Semi-Gloss

10. Concrete Block (Semi-Gloss)

1st coat – Dunn-Edwards Blocfil Select SBSL00

2nd and 3rd coats – Dunn-Edwards Evershield EVSH50 Semi-Gloss

Part 3 – Execution

- A. Do not paint over existing transparent finishes. Existing transparent finishes shall be refinished to match existing. Specify finish compatible with existing.
- B. Protect planting adjacent to buildings. Remove protection of plants daily.
- C. All shop-primed items are to be fully re-primed in the field.
- D. Acid wash all galvanized materials. Etch and prime prior to finish painting and rinse thoroughly.
- E. All existing surfaces to be repaired and prepared prior to painting.
- F. Interior surface preparation of existing walls to include TSP cleaning, sanding and patching of all interior surfaces.
- G. Ensure all surface repair activities, paint preparation activities, or other activities which abrade, scratch, or otherwise cause physical damage to painted surfaces, are performed in compliance with 8 CCR 1532.1 (Cal/OSHA Lead in Construction Standard).
- H. Color-tint sealers and undercoats within general color range of finish color. Vary color of

successive coats sufficiently to distinguish between coats.

- I. Three coat system over existing paint or new primed finishes to consist of one prime coat and two finish coats.
- J. Sand lightly between coats of paint.
- K. Interior Surfaces
 - 1. Wood to be semi-gloss painted, or stained, polyurethane clear finish, for decorative wood doors and casework.
 - 2. Doors and frames to be one color, gloss enamel paint.

END OF DOCUMENT

SECTION 09 96 00 HIGH PERFORMANCE COATINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Exterior Substrates:
 - 1. Steel Structures.
 - 2. Miscellaneous and Ornamental Metals.
 - 3. Galvanized and Non-Ferrous Metals.
 - 4. Concrete, Brick and Concrete Unit Masonry (CMU).
- B. Interior Substrates:
 - 1. Concrete, Vertical and Horizontal Surfaces.
 - 2. Concrete Unit Masonry (CMU).
 - 3. Concrete Floors.
 - 4. Steel Structures.
 - 5. Galvanized and Non-Ferrous Metals.
 - 6. Cement Board, Gypsum Board, and Cement Plaster.
- C. Reference Standards:
 - 1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - 2. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
 - 3. ASTM D3359 - Standard Test Method for Film Hardness by Pencil Test.
 - 4. ASTM D3363 - Standard Test Method for Film Hardness by Pencil Test.
 - 5. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abrader.
 - 6. ASTM D4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
 - 7. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - 8. ASTM D6386 - Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
 - 9. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - 10. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
 - 11. ICRI Guide No. 03732 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays.
 - 12. SSPC-SP 3 - Power Tool Cleaning.
 - 13. SSPC-SP 6/NACE 3 - Commercial Blast Cleaning.
 - 14. SSPC-SP10 - Near White Blast Cleaning.
 - 15. SSPC-SP 13/NACE 6 - Surface Preparation of Concrete.
 - 16. SSPC-PA2 - Measurement of Dry Coating with Magnetic Gauges.

1.3 SUBMITTALS

- A. 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. Application instructions.
 4. Manufacturer's Safety Data Sheets.
- B. Shop Drawings - Submit a complete schedule of products proposed for use, including identifying product names and catalog numbers:
1. Arrange in same format as Finish Schedule.
 2. Include applicable manufacturer's data and recommendations.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, two samples, minimum size 3 inches by 4 inches (76 mm by 102 mm) representing actual product, color, and patterns.
- E. Manufacturer's Certificates: Certify products meet or exceed specified requirements and are suitable for intended application.
- F. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic cleaning and maintenance of coatings specified.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications - Provide all products from a single manufacturer specializing in manufacture of high performance epoxy coatings with a minimum of 10 years' experience:
1. Materials shall be standard products of a single manufacturer.
 2. Secondary materials shall be specifically recommended by coating system manufacturer to ensure compatibility of systems.
- B. Applicator Qualifications: A firm documented experienced applying paints and coatings similar in material, design, and extent to those indicated for this project, whose work has resulted in applications with a record of successful in-service performance.
- C. Regulatory Requirements: Conform to all applicable codes and ordinances for flame, fuel, smoke and volatile organic compounds (VOC) ratings requirements for finishes at time of application.
- D. Mock-Up - Provide a mock-up for evaluation of surface preparation techniques and application workmanship:
1. Located in areas designated by Architect.
 2. Prepare a surface preparation mock-up of each surface condition anticipated for the project.
 3. Prepare a 10-foot by 10-foot (3.05 m by 3.05 m) mock-up for each coating system specified using same materials, tools, equipment, and procedures intended for actual surface preparation and application.
 4. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 5. Refinish mock-up area as required to produce acceptable work.
 6. Retain mock-ups to establish intended standards by which surface preparation and coating systems will be judged.
- E. Pre-Application Meeting:
1. Convene a pre-application meeting two weeks before the start of application of floor coating system.

2. Require attendance of parties directly affecting work of this section, including the Contractor, Architect, Owner's Representative, coating applicator, and a representative of coating material manufacturer.
3. Topics to be discussed at meeting shall include:
 - a. Review of Contract Documents and accepted shop drawings and deviations or differences resolved.
 - b. Review environmental conditions, surface conditions, surface preparation, application procedures, and protection after application.
 - c. Review the surface preparation, application, cleaning, protection and coordination with other work.
 - d. Establish areas on-site available for use as storage areas and working area.
 - e. Review project schedule, and the work that should be completed before coating application.
4. Submit a written meeting report documenting the items discussed with copies to all parties attending within 3 days following the meeting.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with manufacturer's labels clearly identifying product name and manufacturer and the following:
 1. Manufacturer and Coating or material name.
 2. Color name and number.
 3. Batch or lot number.
 4. Date of manufacture.
 5. Mixing and thinning instructions.
- B. Store materials in accordance with the manufacturer's instructions.
 1. Store materials in dry, enclosed area with adequate protection from moisture.
 2. Keep containers sealed until ready for use.
 3. At all times, coatings shall be protected from freezing.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- D. Protect materials during handling and application to prevent damage or contamination.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Specifications are based on products of manufacturers specified. Basis of Design Manufacturer: **TNEMEC Company Inc.**, 800-863-6321. Other manufacturers must have a minimum of five (5) years' experience manufacturing equivalent products to those specified and comply with Division 1 requirements regarding substitutions in order to be considered.

2.2 MATERIALS - GENERAL REQUIREMENTS

- A. Interior Performance Requirements - All Interior Coatings - Supply certified test reports verifying product performance according to the following requirements:
 1. Abrasion:
 - a. Method: ASTM D4060, CS-17 Wheel, 1,000 grams load.
 2. Adhesion:
 - a. Method: ASTM D4541.

- b. Method ASTM D3359 (Method B, Crosshatch).
 - 3. Fresh Water:
 - a. Method: Coating system applied to SSPC-SP10 cleaned hot-rolled steel, cured 7 days prior to testing and immersed in aerated tap water at 77 degrees F.
 - 4. Salt Spray:
 - a. Method: ASTM B117 applied to SSPC-SP10 cleaned hot-rolled steel.
- B. Exterior Performance Requirements - All Exterior Coatings - Supply certified test reports verifying product performance according to the following requirements:
 - 1. Abrasion:
 - a. Method: ASTM D4060, CS-17 Wheel, 1,000 grams load.
 - 2. Adhesion:
 - a. Method: ASTM D4541.
 - b. Method: ASTM D3359 (Method B).
 - 3. Exterior Exposure:
 - a. Method: Exposed at 45 degrees facing ocean.
 - b. Location: Atlantic Seacoast - 80-foot fence.
 - 4. Fresh Water (Where Applicable):
 - a. Method: Coating system applied to sandblasted steel panels, cured for 7 days at 77 degrees F and immersed in tap water at 77 degrees F.
 - 5. Hardness:
 - a. Method: ASTM D3363 (Pencil).
 - 6. Humidity:
 - a. Method: ASTM D2247.
 - 7. Salt Spray (Fog):
 - a. Method: ASTM B117.
 - 8. Graffiti Resistance (Where Applicable):
 - a. Method: The following graffiti materials applied to coating and allowed to dry for 7 days: acrylic, epoxy-ester and alkyd spray paints, crayon, lipstick, shoe polish, ball point and Markette marker. Removal first attempted with xylene, if graffiti remained then methyl ethyl ketone (MEK) was tried; if graffiti remained, spray pack Vandal Mark Remover was used.
 - b. Requirement: Complete and easy removal of listed media using xylene or methyl ethyl ketone (MEK), and no dulling of the surface. Metallic zinc dust content by weight in the dry film.
 - 9. Metallic zinc dust content by weight in the dry film.
 - 10. Consumer Product Safety Act Regulations Part 1303.

2.3 COATING SYSTEMS FOR STEEL, BAR JOIST, HANDRAILS, MISCELLANEOUS METALS INTERIOR

- A. Shop Primer, Interior Exposed, Concealed:
 - 1. System Type: Inorganic Water-Based Epoxy Primer.
 - 2. Surface Preparation: SSPC SP6/NACE 3.
 - 3. Primer (Shop): Tnemec; Series 27WB Typoxy, DFT 4.0 to 6.0 mils (100 to 150 microns).
 - 4. Total DFT: 4.0 to 6.0 mils (100 to 150 microns).
 - 5. Color:
 - a. As selected by Architect from manufacturer's standard colors.
- B. Extended Field Exposure of Shop Primer and/or Moderate Conditions:
 - 1. System Type: Epoxy/Acrylic.
 - 2. Surface Preparation: SSPC-SP 6/NACE 3.
 - 3. Shop Primer: Tnemec; Series 66HS Hi-Build Epoxoline, DFT 3.0 to 5.0 mils (75 to 130 microns).

4. First Coat:
 - a. Tnemec; Series 1028 Enduratone (semi-gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 - b. Tnemec; Series 1029 Enduratone (low semi-gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 5. Finish Coat:
 - a. Tnemec; Series 1028 Enduratone (semi-gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 - b. Tnemec; Series 1029 Enduratone (low semi-gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 6. Total DFT: 7.0 to 11.0 mils (175 to 280 microns).
 7. Color:
 - a. As selected by Architect from manufacturer's standard colors.
- C. Interior Wet and/or Chemical Exposure, Physical Abuse - Handrails, Structural Steel, Miscellaneous Metals:
1. System Type: Epoxy.
 2. Surface Preparation: SSPC SP 6/NACE 3.
 3. Shop Primer:
 - a. Tnemec; Series 66HS Hi-Build Epoxoline, DFT 3.0 to 5.0 mils (75 to 130 microns).
 4. Finish Coat (Field):
 - a. Tnemec; Series 66HS Hi-Build Epoxoline, DFT 4.0 to 6.0 mils (100 to 150 microns).
 5. Total DFT: 7.0 to 11.0 mils (175 to 280 microns).
 6. Color:
 - a. As selected by Architect from manufacturer's standard colors.
- D. Natatorium, Structural Steel and Bar Joists:
1. System Type: Zinc Rich Urethane/Acrylic.
 2. Surface Preparation (Shop): SSPC SP6/NACE 3.
 3. Shop Application:
 - a. Primer: Tnemec; Series 94-H20 Hydro-Zinc, DFT 2.5 to 3.5 mils (65 to 90 microns).
 - b. Finish Coat: Tnemec; Series 115 Uni-Bond DF, DFT 2.5 to 3.5 mils (65 to 90 microns). Apply finish coat to steel and joist surfaces that will be concealed after erection, such as, top flange or steel to be embedded in concrete and masonry.
 4. Field Application:
 - a. First Coat (Field): Tnemec; Series 115 Uni-Bond DF, DFT 2.5 to 3.5 mils (65 to 90 microns).
 - b. Finish Coat (Field): Tnemec; Series 115 Uni-Bond DF (eggshell), DFT 2.5 to 3.5 mils (65 to 90 microns).
 5. Total DFT: 7.5 to 10.5 mils (190 to 270 microns).
 6. Color:
 - a. As selected by Architect from manufacturer's standard colors.

2.4 COATING SYSTEMS FOR SHOP PRIMED STEEL TRIM, DOORS, WINDOWS - INTERIOR & EXTERIOR

- A. Dry/Moderate:
1. System Type: Epoxy/Acrylic.
 2. Surface Preparation: SSPC SP6/NACE 3.
 3. Shop Primer: Tnemec; Series 66HS Hi-Build Epoxoline, DFT 3.0 to 5.0 mils (75 to 130 microns).
 4. First Coat (Field):
 - a. Tnemec; Series 1028 Enduratone (gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).

- b. Tnemec; Series 1029 Enduratone (low semi-gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 - 5. Finish Coat (Field):
 - a. Tnemec; Series 1028 Enduratone (gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 - b. Tnemec; Series 1029 Enduratone (low semi-gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 - 6. Total DFT: 7.0 to 11.0 mils (175 to 280 microns).
 - 7. Color:
 - a. As selected by Architect from manufacturer's standard colors.
- B. Dry to Wet/Moderate to Severe:
 - 1. System Type: Zinc Rich/Epoxy/Urethane.
 - 2. Surface Preparation – SSPC SP6/NACE 3:
 - a. Shop Primer: Tnemec; Series 94-H20 Hydro-Zinc, DFT 2.5 to 3.5 mils (65 to 90 microns).
 - 3. Intermediate Coat (Field):
 - a. Tnemec; Series 66HS Hi-Build Epoxoline, DFT 2.0 to 3.0 mils (50 to 75 microns).
 - 4. Finish Coat (Field):
 - a. Tnemec; Series 740 UVX or Tnemec; Series 1080 Endura-Shield (gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 - b. Tnemec; Series 750 UVX or Tnemec; Series 1081 Endura-Shield (semi-gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 - 5. Total DFT: 6.5 to 9.5 mils (165 to 241 microns).
 - 6. Color:
 - a. As selected by Architect from manufacturer's standard colors.

2.5 COATING SYSTEMS FOR STEEL - EXTERIOR

- A. Atmospheric, Aggressive Corrosion, Coastal, UV Exposure, Chemical, Physical Abuse: Parking Garage Structures, Exterior Handrails, Ornamental & Miscellaneous Metals, and Canopy Steel:
 - 1. System Type: Zinc/Epoxy/Waterborne Urethane.
 - 2. Surface Preparation: SSPC SP6/NACE 3.
 - 3. Shop Primer:
 - a. Tnemec; Series 94-H20 Hydro-Zinc, DFT 2.5 to 3.5 mils (65 to 90 microns).
 - 4. Intermediate Coat:
 - a. Tnemec; Series 66HS Hi-Build Epoxoline, DFT 2.0 to 3.0 mils (50 to 75 microns).
 - 5. Finish Coat:
 - a. Tnemec; Series 740 UVX or Tnemec; Series 1080 Endura-Shield (gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 - b. Tnemec; Series 750 UVX or Tnemec; Series 1081 Endura-Shield (semi-gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 - 6. Total DFT: 6.5 to 9.5 mils (165 to 240 microns).
 - 7. Color:
 - a. As selected by Architect from manufacturer's standard colors.
- B. Exterior Exposed Steel (Overcoat):
 - 1. System Type: Acrylic/Polyurethane or Polycarbamide.
 - 2. Surface Preparation: SSPC SP6/NACE 3.
 - 3. Primer:
 - a. Tnemec; Series 118 Uni-Bond Mastic, DFT 6.0 to 8.0 mils (150 to 205 microns).
 - 4. Finish Coat:
 - a. Tnemec; Series 740 UVX (gloss), DFT 2.0 to 3.0 mils ((50 to 75 microns).
 - b. Tnemec, Series 750 UVX (semi-gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 - 5. Total DFT: 8.0 to 11.0 mils (200 to 280 microns).

6. Color:
 - a. As selected by Architect from manufacturer's standard colors.

2.6 COATING SYSTEMS FOR CONCRETE AND MASONRY EXTERIOR

- A. Mild to Severe Exposure:
 1. System Type: Water-Based Modified Acrylate.
 2. Surface Preparation: SSPC SP13/NACE 6, Clean and Dry.
 3. Block Filler: Series 130 Envirofill 85 to 115 square feet per gallon.
 4. Primer:
 - a. Series 156 Enviro-Crete, DFT 4.0 to 8.0 mils (100 to 205 microns).
 - b. Series 157 Enviro-Crete, DFT 6.0 to 9.0 mils (150 to 230 microns).
 5. Finish Coat:
 - a. Series 156 Enviro-Crete (smooth/matte), DFT 4.0 to 8.0 mils (100 to 205 microns).
 6. Series 157 Enviro-Crete (sand texture/matte), DFT 6.0 to 9.0 mils (150 to 230 microns).
 7. Total DFT:
 - a. Series 156 Enviro-Crete (smooth/matte), DFT 8.0 to 16.0 mils (205 to 410 microns) over block filler.
 - b. Series 157 Enviro-Crete (sand texture), DFT 12.0 to 18.0 mils (300 to 460 mils) over block filler.
 8. Color:
 - a. As selected by Architect from manufacturer's standard colors.

2.7 COATING SYSTEMS FOR CONCRETE FLOORS

- A. Moderate Service and Traffic:
 1. System Type: 100% Solids Epoxy.
 2. Surface Preparation: SSPC SP13/NACE 6. Shot blast or mechanically abrade.
 3. Primer:
 - a. Tnemec; Series 201 Epoxoprime, DFT 10.0 to 12.0 mils (250 to 305 microns).
 4. Intermediate Coat:
 - a. Tnemec; Series 280 Tneme-Glaze, DFT 6.0 to 8.0 mils (150 to 205 microns).
 - b. Tnemec; Series 281 Tneme-Glaze (gloss), DFT 6.0 to 8.0 mils (150 to 205 microns).
 5. Finish Coat:
 - a. Tnemec; Series 280 Tneme-Glaze (gloss/orange peel), DFT 6.0 to 8.0 mils (150 to 205 microns).
 - b. Tnemec; Series 281 Tneme-Glaze, DFT 6.0 to 8.0 mils (150 to 205 microns).
 6. Total DFT: 22.0 to 28.0 mils (550 to 715 microns).
 7. Color:
 - a. As selected by Architect from manufacturer's standard colors.
- B. Moderate to Heavy Service, Areas Frequently Wet:
 1. System Type: Aggregate-filled epoxy laminate.
 2. Surface Preparation – SSPC SP13/NACE 6. Shot blast or mechanically abrade.
 3. Primer:
 - a. Tnemec; Series 201 Epoxoprime, DFT 6.0 to 8.0 mils (150 to 205 microns).
 4. Intermediate Coat:
 - a. Tnemec; Series 237 Power-Tread, double broadcast, DFT 1/8 inch (125 mils or 3,176 microns).
 5. Finish Coat:
 - a. Tnemec; Series 280 Tneme-Glaze (gloss/orange peel), DFT 8.0 to 12.0 mils (200 to 305 microns).
 6. Total DFT: 1/8-inch Nominal Thickness system

7. Color:
 - a. As selected by Architect from manufacturer's standard colors.
- C. Moderate Service, Wet Areas, Decorative, Locker Rooms:
1. System Type: Ceramic-filled epoxy laminate.
 2. Surface Preparation - SSPC-SP 13/NACE 6. Shot blast or mechanically abrade.
 3. Primer:
 - a. Tnemec; Series 201 Epoxoprime DFT 6.0 to 8.0 mils (150 to 205 microns).
 4. Intermediate Coat:
 - a. Tnemec; Series 222-Colored Quartz Deco-Tread, double broadcast, DFT 1/8 inch (125 mils or 3,176 microns) (3 mm).
 - b. Tnemec; Series 224 Deco-Flake, double broadcast, DFT 1/8 inch (125 mils or 3,176 microns) (3 mm).
 5. Intermediate Color:
 6. As selected by Architect from manufacturer's standard colors.
 7. Finish Coat:
 - a. Tnemec; Series 284 Deco-Clear (clear), DFT 8.0 to 10.0 mils (205 to 250 microns).
 8. Total DFT: 1/8-inch nominal thickness system
 9. Color - Colored Quartz and Clear:
 - a. As selected by Architect from manufacturer's standard colors.

2.8 COATING SYSTEMS FOR STUCCO AND CEMENTITIOUS MATERIALS

- A. Exterior Exposure:
1. System Type: Modified Waterborne Acrylate.
 2. Surface Preparation: Clean and dry.
 3. Primer:
 - a. Tnemec; Series 156 Enviro-Crete, DFT 4.0 to 8.0 mils (100 to 205 microns).
 - b. Tnemec; Series 157 Enviro-Crete, DFT 6.0 to 9.0 mils (150 to 230 microns).
 4. Finish Coat:
 - a. Tnemec; Series 156 Enviro-Crete (smooth/matte), DFT 4.0 to 8.0 mils (100 to 205 microns).
 - b. Tnemec; Series 157 Enviro-Crete (sand texture), DFT 6.0 to 9.0 mils (150 to 230 microns)
 5. Total DFT:
 - a. Tnemec; Series 156 Enviro-Crete (smooth/matte), DFT 8.0 to 16.0 mils (205 to 410 microns).
 - b. Tnemec; Series 157 Enviro-Crete (sand texture), DFT 12.0 to 18.0 mils (300 to 460 microns).
 6. Color:
 - a. As selected by Architect from manufacturer's standard colors.

2.9 COATING SYSTEMS FOR GALVANIZED STEEL AND NON-FERROUS METAL - INTERIOR

- A. Overhead Deck, Ductwork, Conduit, Dry - Moderate to Severe, Damp: Natatoriums, Warehouses:
1. System Type: Self Cross-linking Hydrophobic Acrylic.
 2. Surface Preparation: ASTM D6386 Abrasive Blast or Zinc Phosphate Treatment for Galvanized Steel.
 3. Primer: Must be applied within one hour after surface preparation
 - a. Tnemec; Series 115 Uni-Bond DF, DFT 2.0 to 3.0 mils (50 to 75 microns).
 4. Finish Coat:
 - a. Tnemec; Series 115 Uni-Bond DF (eggshell), DFT 2.0 to 3.0 mils (50 to 75 microns).
 5. Total DFT: 4.0 to 6.0 mils (100 to 150 microns).

6. Color:
 - a. As selected by Architect from manufacturer's standard colors.
 - b. As indicated on the Drawings.

2.10 COATING SYSTEMS FOR GALVANIZED STEEL AND NONFERROUS METAL INTERIOR OR EXTERIOR

- A. Moderate Conditions and/or UV Exposure:
 1. System Type: Polyamidoamine Epoxy/Waterborne Urethane.
 2. Surface Preparation: ASTM D6386 Abrasive Blast or Zinc Phosphate Treatment for Galvanized Steel.
 3. Primer - Must be applied within one hour after surface preparation:
 - a. Tnemec: Series 66HS Hi-Build Epoxoline, DFT 3.0 to 5.0 mils (75 to 125 microns).
 4. Finish Coat:
 - a. Tnemec: Series 740 UVX or Tnemec; Series 1080 Endura-Shield (gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 - b. Tnemec: Series 750 UVX or Tnemec; Series 1081 Endura-Shield (semi-gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 5. Total DFT: 5.0 to 8.0 mils (125 to 205 microns).
 6. Color:
 - a. As selected by Architect from manufacturer's standard colors.

2.11 COATING SYSTEMS FOR CEMENT BOARD, GYPSUM BOARD AND CEMENT PLASTER INTERIOR

- A. Dry/Moderate/Scrubable:
 1. System Type: Waterborne Epoxy-Amine Adduct/Ceramic-Modified Waterborne Aliphatic Polyurethane.
 2. Surface Preparation: Clean and Dry
 3. Primer:
 - a. Tnemec: Series 287 Enviro-Glaze, DFT 2.0 to 3.0 mils (50 to 75 microns).
 4. Intermediate Coat:
 - a. Tnemec: Series 287 Enviro-Glaze, DFT 2.0 to 3.0 mils (50 to 75 microns).
 5. Finish Coat:
 - a. Tnemec: Series 297 Enviro-Glaze (gloss), DFT 2.0 to 3.0 mils (50 to 75 microns).
 6. Total DFT: 6.0 to 9.0 mils (150 to 230 microns).
 7. Color:
 - a. As selected by Architect from manufacturer's standard colors.
- B. Wet, Moderate, Severe:
 1. System Type: 100% Solids Amine Epoxy.
 2. Surface Preparation: Clean and dry.
 3. Primer:
 - a. Tnemec: Series 201 Epoxoprime, DFT 2.0 to 4.0 mils (50 to 100 microns). (Two coats required on gypsum board).
 4. Intermediate Coat:
 - a. Tnemec: Series 280 Tneme-Glaze, DFT 2.0 to 4.0 mils (50 to 100 microns).
 5. Finish Coat:
 - a. Tnemec: Series 280 Tneme-Glaze, DFT 2.0 to 4.0 mils (50 to 100 microns).
 6. Total DFT: 6.0 to 12.0 mils (150 to 300 microns) or 8.0 to 16.0 (205 to 410 microns) for Gypsum Board.
 7. Color:
 - a. As selected by Architect from manufacturer's standard colors.

- C. Severe, Physical Contact, Wet, Bathrooms, Showers:

1. System Type: Matte Lay-up/Epoxy Fiber Glass.
2. Surface Preparation: Clean and dry.
3. Joints: Finish and feather using Tnemec; Series 215 Surfacing Epoxy per manufacturer's recommendations.
4. Primer Coat:
 - a. Tnemec: Series 201 Epoxoprime, DFT 6.0 to 8.0 mils (150 to 205 microns).
5. Intermediate Coat:
 - a. Tnemec: Series 273 Stranlok ML, DFT 12.0 to 16.0 mils (300 to 410 microns).
 - b. Tnemec: Series 273-0273C Glass Mat, lay mat into wet film.
6. Saturate Coat:
 - a. Tnemec: Series 280 Tneme-Glaze, DFT 12.0 to 16.0 mils (300 to 410 microns).
7. Finish Coat:
 - a. Tnemec: Series 280 Tneme-Glaze (gloss), DFT 6.0 to 8.0 mils (150 to 205 microns).
8. Total DFT: 37.0 to 56.0 mils (900 to 1,410 microns).
9. Color:
 - a. As selected by Architect from manufacturer's standard colors.

PART 3 EXECUTION

3.1 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

3.2 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with manufacturer's instructions.
- C. Schedule coating work to avoid excessive dust and airborne contaminants. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

3.3 COORDINATION

- A. Coordinate Work with other operations to avoid damage to installed materials

3.4 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify substrate surfaces are ready to receive work as instructed by coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.5 PREPARATION

- A. General: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. Surface Preparation Of Steel:
 - 1. Prepare steel surfaces in accordance with manufacturer's instructions.
 - 2. Fabrication Defects:
 - a. Correct steel and fabrication defects revealed by surface preparation.
 - b. Remove weld spatter and slag.
 - c. Round sharp edges and corners of welds to a smooth contour.
 - d. Smooth weld undercuts and recesses.
 - e. Grind down porous welds to pinhole-free metal.
 - f. Remove weld flux from surface.
 - 3. Ensure surfaces are dry.
 - 4. Remove visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter in accordance with SSPC SP6/NACE 3, unless otherwise specified.
 - 5. Abrasive Blast-Cleaned Surfaces: Coat abrasive blast-cleaned surfaces with primer before visible rust forms on surface. Do not leave blast-cleaned surfaces uncoated for more than 8 hours.
 - 6. Shop Primer: Prepare shop primer to receive field coat in accordance with manufacturer's instructions.
- C. Surface Preparation of Concrete and Masonry:
 - 1. Prepare concrete surfaces in accordance with manufacturer's instructions, SSPC SP13/NACE 6.
 - 2. Concrete Masonry Units: Allow concrete and mortar to cure 28 days. Surfaces must be clean, dry, and free of oil, grease and other contaminants. Level protrusions and mortar spatter. Voids and other defects should be filled with recommended filler or surfacer.
 - 3. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.
 - 4. Test concrete for moisture in accordance with ASTM D4263 and F1869.
 - 5. Allow concrete and mortar to cure for a minimum of 28 days before coating.
 - 6. Level protrusions and mortar spatter.
- D. Surface Preparation of Wood:
 - 1. Ensure wood surfaces are clean and dry, and free of dust, dirt and other contaminants.
 - 2. Remove surface deposits, sap or pitch by scraping and wiping clean with rags dampened with mineral spirits or VM&P Naphtha.
 - 3. Seal knots and pitch pockets with shellac reduced with equal parts of shellac thinner (denatured alcohol) before priming.
 - 4. Sand rough spots with the grain, starting with medium grit sandpaper and finishing with fine grit. Remove sanding dust.
 - 5. After the prime coat is dry, fill cracks and holes with a suitable compound that is compatible with the substrate and coating. When filler is hard, sand flush with the surface using the fine grit sand paper.
 - 6. Sand lightly between coats with fine grit, open-coat sandpaper.
- E. Surface Preparation of Stucco And Plaster:
 - 1. Prepare stucco and plaster surfaces in accordance with manufacturer's instructions.
 - 2. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.
 - 3. Allow stucco and plaster to cure and dry out for a minimum of 14 days before coating.
 - 4. Do not coat over stucco or plaster containing free water, lime, or other soluble alkaline salts.

5. Remove plaster nibs and other protrusions.
 6. Patch voids and cracks with approved materials and after dry, sand flush with surface
- F. Surface Preparation of Galvanized Steel and Nonferrous Metal:
1. Prepare galvanized steel per SSPC SP16.
 2. Prepare nonferrous metal surfaces in accordance with manufacturer's instructions. Surface preparation recommendations will vary depending on substrate and exposure conditions.
- G. Surface Preparation of Gypsum Board:
1. Prepare gypsum board surfaces in accordance with manufacturer's instructions.
 2. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.
 3. Sand joint compound smooth and feather edge.
 4. Avoid heavy sanding of adjacent gypsum board surfaces, which will raise nap of paper covering.
 5. Do not apply putty, patching pencils, caulking, or masking tape to gypsum board surfaces to be painted.
 6. Lightly scuff-sand tape joints after priming to remove raised paper nap. Do not sand through primer.

3.6 APPLICATION

- A. Apply coatings in accordance with manufacturer's instructions.
- B. Mix and thin coatings, including multi-component materials, in accordance with manufacturer's instructions.
- C. Keep containers closed when not in use to avoid contamination.
- D. Do not use mixed coatings beyond pot life limits.
- E. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.
- F. Uniformly apply coatings at spreading rate required to achieve specified DFT.
- G. Apply coatings to be free of film characteristics or defects that would adversely affect performance or appearance of coating systems.
- H. Apply primer as recommended for the application. Components shall be pre-mixed, blended, and applied according to manufacturer's directions.
- I. Components for subsequent coats shall be mixed and applied in strict accordance with manufacturer's directions.

3.7 FIELD QUALITY CONTROL

- A. Inspector's Services - Coordinate with Independent Inspection Services provided by the Owner. Services include:
 1. Coordinate with coating manufacturer's technical service department or independent sales representative for current technical data and instructions.
 2. Verify suitability of moisture vapor emission rate of concrete floor surfaces.

3. Verify coatings and other materials are as specified.
 4. Verify surface preparation and application is as specified.
 5. Verify DFT of each coat and total DFT of each coating system specified using wet film and dry film gauges.
 6. Coating Defects: Check coatings for film characteristics or defects that would adversely affect performance or appearance of coating systems.
 7. Report:
 - a. Submit daily written reports describing inspections made and actions taken to correct non-conforming work.
 - b. Report non-conforming work not corrected.
 - c. Submit copies of report to Architect and Contractor.
- B. Coating manufacturer's representative to verify that installation is in conformance to the manufacturer's recommendations.

3.8 CLEANING

- A. Remove temporary coverings and protection of surrounding areas and surfaces.

3.9 REPAIR

- A. Materials and Surfaces Not Scheduled to be Coated: Repair or replace damaged materials and surfaces not scheduled to be coated.
- B. Damaged Coatings: Touch-up or repair of damaged coatings. Touch-up of minor damage shall be acceptable where result is not visibly different from adjacent surfaces. Recoat entire surface where touch-up result is visibly different, either in sheen, texture, or color.
- C. Coating Defects: Repair in accordance with manufacturer's instructions coatings that exhibit film characteristics or defects that would adversely affect performance or appearance of coating systems.

3.10 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. Immediately remove coatings that fall on surrounding areas and surfaces not scheduled to be coated.
- D. Protect installed products until completion of project.
- E. Touch-up, repair or replace damaged products before Substantial Completion.
- F. Remove temporary coverings and protection of surrounding areas and surfaces.

3.11 SCHEDULES

- A. Refer to Drawings:

END OF SECTION 09 96 00

SECTION 09 96 23

GRAFFITI RESISTANT COATINGS

Part 1 – General

A. Related Sections

1. 03 30 00: Cast in Place Concrete
2. 04 22 00: Concrete Unit Masonry
3. 05 50 00: Metal Fabrications

B. Comply with VOC requirements per CAL-EPA. 🌐

Part 2 – Products

A. Manufacturer

1. RainguardPro
2. Monochem
3. Or Approved Equal

B. Non-sacrificial Anti-Graffiti Coating:

1. Basis of Design: VandlGuard Ten from RainguardPro
2. Permashield Premium from Monochem

C. VOC compliant. 🌐

D. Application as specified by manufacturer.

Part 3 – Execution

- A. Surface preparation per SSPC Society for Protective Coatings, Surface Preparation Standards (SSPC-SP).
- B. Install on surfaces under eight feet. Continue coating to logical break such as a control joint of top of wall over eight feet.
- C. Verify compatibility with block and concrete sealer or other primers.

END OF DOCUMENT

SECTION 10 14 00

SIGNAGE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Room identification signs.
 - 2. Restroom signs.
 - 3. Misc. identification signs.
 - 4. Informational signs (not identification signs).
 - 5. Accessories necessary for a complete installation.
- B. Related Sections:
 - 1. Section 06 10 00: Rough Carpentry.
 - 2. Section 09 21 16: Gypsum Board Assemblies.

1.3 SUBMITTALS

- A. Product Data: Technical data for each type of signage.
- B. Shop Drawings:
 - 1. Submit fabrication and installation details and attachments to other work:
 - a. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - b. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
 - c. Exterior applied signage on face of wall to include mounting brackets and support anchorage to fit condition.
 - 2. Provide signage schedule include location and directional arrows.
- C. Samples: Submit one sample of each specified sign type, full-sized.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Accessibility Requirements:
 - a. Comply with applicable requirements:
 - 1) Americans with Disabilities Act of 1990, as amended:
 - a) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design.
 - 2) CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA):
 - a) CBC Chapter 11B, Access to Public Buildings, Public Accommodations,

Commercial Buildings and Public Housing.

- b. CFC – 2022 California Fire Code.
 - c. California Code of Regulations (CCR):
 - 1) CCR 19-3 - Title 19, Chapter 3.
 - d. Pictograms: Comply with CBC Section 11B-703.6.
 - e. Variable Message Signs: Comply with CBC Section 11B-703.8.
 - f. All signage must comply with 11B-703
 - g. Font: Helvetica Narrow unless noted otherwise
 - h. Font size: 1" unless noted otherwise
 - i. Font color: White
 - j. Font color background: It shall contrast 70% min with door.
- B. Field Inspections:
- 1. All new tactile signage must be field inspected after installation per CBC 11B-703.1.1.2.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
- 1. Subject to compliance with requirements, provide products by one of the following:
 - a. ASI Modulex, Inc.
 - b. InPro Corporation (IPC).
 - c. Mohawk Sign Systems.
 - d. Seton Identification Products.
- B. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated. Refer to drawings for location.
- C. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated. Refer to drawings for location.
- D. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- E. Acrylic Sheet: ASTM D 4802, category standard with manufacturer for each sign, Type UVF (UV filtering).
- F. Plastic Laminate Sheet: NEMA LD 3, general purpose HGS grade, 0.048-inch (1.2-mm) nominal thickness.
- G. Vinyl Film: UV resistant vinyl film of nominal thickness indicated, with pressure sensitive, permanent adhesive on back; die cut to form characters or images indicated and suitable for exterior applications.
- H. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.
- I. Accessories:

1. Fasteners and Anchors:
 - a. As necessary for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - 1) Use concealed fasteners and anchors unless indicated to be exposed.
 - 2) Exposed Metal Fastener Components: Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
2. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
3. Adhesive: Recommended by sign manufacturer.
4. Two Face Tape: High bond, foam core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.
5. Bituminous Paint: Cold applied asphalt emulsion complying with ASTM D 1187.

2.2 SIGNAGE

- A. Laminated Plastic Tactile Room, Restroom and Miscellaneous Identification Signs:
 1. Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - a. Laminated Sheet Sign:
 - 1) Photopolymer face sheet with raised graphics laminated over subsurface graphics to acrylic backing sheet to produce composite sheet:
 - a) Color(s): Selected by Architect from manufacture's full range of standard colors.
 - b. Sign Panel Perimeter:
 - 2) Finish edges smooth:
 - a) Edge Condition: Beveled.
 - b) Corner Condition in Elevation: Square.
 - c. Mounting at Walls: Stainless steel vandal-proof pin-in-head torx screws Surface mounted to wall with concealed anchors.
 - d. Mounting at Glazing: Clear silicone adhesive.
 - e. Text and Typeface, Panel and Photo Polymer Signs:
 - 3) Accessible raised characters and Braille. Finish raised characters to contrast with background color, and finish Braille to match background color:
 - a) Raised Characters: Refer to Drawings.
 - b) California Contracted Grade 2 Braille: Refer to Drawings.
 - c) Pictograms: Field height of minimum 6 inches; no characters or braille in pictogram field; non-glare, field contrast to pictogram, text descriptors below pictogram field
 - d) Accessibility Symbols: Where used, symbols shall comply with CBC 11B-703.7.
- B. Solid Plastic Tactile Room, Restroom and Miscellaneous Identification Signs:
 1. 1/4-inch thick, Graphic Process Sand Carved with pre-drilled holes for mounting screws:
 - a. Sign Panel Perimeter:
 - 1) Edge Condition: Square cut.
 - 2) Corner Condition in Elevation: 3/8" radius.
 - b. Mounting at Walls: Stainless steel vandal-proof pin-in-head torx screws
 - c. Mounting at Glazing: Clear silicone adhesive
 - d. Text and Typeface:
 - 3) Accessible raised characters and Braille. Finish raised characters to contrast with background color, and finish Braille to match background color:

- a) Raised Characters: Refer to drawings
 - b) California Contracted Grade 2 Braille: Refer to drawings
 - c) Pictograms: Field height of minimum 6 inches; no characters or braille in pictogram field; non-glare, field contrast to pictogram, text descriptors below pictogram field
 - d) Accessibility Symbols: Where used, symbols shall comply with CBC 11B-703.2.
 - e. Color: As selected by Architect from manufacture's full range of standard colors.
 - f. For exterior uses, fabricate signs from exterior grade materials with UV inhibitor.
- C. Cast Characters:
- 1. Characters with uniform faces, sharp corners, and precisely formed lines and profiles:
 - a. Character Material: Cast aluminum.
 - b. Character Height: Indicated on Drawings.
 - c. Finishes:
 - 1) Baked Enamel or Powder Coat Finish: Color to be selected by the Architect from manufacture's full range of standard colors.
 - 2) Overcoat: Baked on clear coating.
 - d. Mounting: Concealed studs.
 - e. Typeface: Selected by Architect.
- D. Field Applied, Vinyl Character Sign:
- 1. Pre-spaced characters die cut from 3 mil to 3.5 mil (0.076 mm to 0.089 mm) thick, weather resistant vinyl film with release liner on the back and carrier film on the front for onsite alignment and application:
 - f. Manufacturers:
 - 1) Subject to compliance with requirements, provide products by one of the following:
 - a) Allen Markings.
 - b) APCO Graphics, Inc.
 - c) Mohawk Sign Systems.
 - d) Seton Identification Products.
 - 2) Size: Indicated on Drawings.
 - 3) Substrate: Indicated on Drawings.

2.3 FABRICATION

- A. Provide sign assemblies according to requirements indicated:
- 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 5. Internally brace signs for stability and for securing fasteners.
 - 6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
 - 7. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other

defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

- B. Brackets:
 - 1. Fabricate brackets, fittings, and hardware for bracket mounted signs to suit sign construction and mounting conditions indicated. Modify brackets as necessary:
 - a. Aluminum Brackets: Factory finish brackets with baked enamel or powder coat finish to match sign background color unless otherwise indicated.

2.4 FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.
- E. Aluminum Finishes:
 - 1. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.
 - 2. Baked Enamel or Powder Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

3.2 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of signage work. Verify sign support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- B. Proceed with installation after correcting unsatisfactory conditions.

3.3 INSTALLATION

- A. Install signs using mounting methods indicated and according to manufacturer's written

instructions:

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 3. Interior Wall Signs:
 - a. Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door:
 - 1) See drawings for the mounting height and location of each sign.
 4. Before installation, verify sign surfaces are clean and free of materials or debris that impair installation.
 5. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Height:
1. Tactile characters on signs shall be located 48 inches minimum to the baseline of the lowest Braille cells and 60 inches maximum to the baseline of the highest line of raised characters above the finish floor or ground surface, pursuant to CBC Section and Figure 11B-703.4.1.
- C. Mounting Location:
1. A tactile sign shall be located as follows, pursuant to CBC Section and Figure 11B-703.4.2:
 - a. Alongside a single door at the latch side.
 - b. On the inactive leaf at double doors with one active leaf.
 - c. To the right of the right hand door at double doors with two active leaves.
 - d. On the nearest adjacent wall where there is no wall space at the latch side of a single door or at the right side of double doors with two active leaves.
 - e. So that a clear floor space of 18 inches by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.
- D. Mounting Methods:
1. Exposed Fastener: Install vandal-resistant fastener; set screw head flush with sign face.
 2. Concealed Studs:
 - a. Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface:
 - 1) Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - 2) Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
 3. Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.
 4. Shim Plate Mounting: Provide 1/8 inch (3 mm) thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other direct mounting methods are impractical. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach signs to plate using method specified above.
- E. Visual Characters shall comply with CBC Section 11B-703.5 and shall be 40 inches minimum above finish floor or ground.

- F. Field Applied, Vinyl Character Signs: Clean and dry substrate. Align sign characters in final position before removing release liner. Remove release liner in stages, and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.
- G. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.
- H. DSA Inspections: Signs and identifications or other information shall be field inspected after installation and approved by Division of the State Architect prior to the issuance of a final certificate of occupancy, or final approval where no certificate of occupancy is issued. The inspection shall include, but not limited to, verification that Braille dots and cells are properly spaced and the size, proportion and type of raised characters are in compliance with CBC, Section 11B-703.1.1.2.

3.4 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 00

SECTION 10 21 13 TOILET COMPARTMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Toilet partitions.
 - 2. Urinal screens.
 - 3. Entrance screens.
 - 4. Accessories necessary for a complete installation.
- B. Related Sections:
 - 1. Section 05 50 00: Metal Fabrications.
 - 2. Section 06 10 00: Rough Carpentry.

1.3 SUBMITTALS

- A. Product Data: Technical data for each type of product including construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings - Submit plans, elevations, sections, details, and attachments to other work:
 - 1. Show locations of cutouts for compartment-mounted toilet accessories.
 - 2. Show locations of reinforcements for compartment-mounted grab bars.
 - 3. Show locations of centerlines of toilet fixtures.
 - 4. Show ceiling grid and overhead support or bracing locations.
- C. Samples: Submit for each type of unit with samples of hardware and accessories involving material and color selection.
- D. Maintenance Data: Submit data to include in maintenance manuals.

1.4 PERFORMANCE REQUIREMENTS

- A. Accessible Toilet Compartments:
 - 1. Wheelchair accessible compartment shall comply with CBC Section 11B-604.8.1.
 - 2. Toe clearance for at least one side partition of a wheelchair accessible compartment shall comply with CBC Section and Figure 11B-604.8.1.4. It shall be a minimum of 9 inches high above the finish floor, and a minimum of 6 inches deep beyond the compartment side face of the partition, exclusive of partition support members. It shall be a minimum of 12 inches high above the finish floor for children's use. Partition components at toe clearances shall be smoother without shop edges or abrasive surfaces. Toe clearance at the side partition is not required in a compartment greater than 66 inches wide.
 - 3. Ambulatory accessible compartments shall be provided where there are six or more toilet compartments, or where the combination of urinals and water closets total six or more fixtures. Such compartments shall be provided in the same quantity as wheelchair accessible compartments per CBC Section 11B-213.3.1 and shall comply

- with CBC Section 11B-604.8.2.
- 4. Door and door hardware for accessible compartments shall be self-closing and shall comply with CBC Section 11B-404 except that if the approach is to the latch side of an ambulatory compartment door, clearance between the door side of the compartment and any obstruction shall be 44 inches minimum. See CBC Figure 11B-604.8.2.
- 5. A door pull complying with CBC Section 11B-404.2.7 shall be placed on both sides of the accessible compartment door near the latch.
- 6. Ambulatory Accessible Toilet Compartment doors shall not swing into the clear floor space or clearance required for any fixture or into the minimum required compartment area. See CBC Section 11B-604.8.2.2.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Accessibility Requirements - Comply with applicable requirements:
 - a. Americans with Disabilities Act of 1990, as amended:
 - 1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design.
 - b. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA):
 - 1) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
 - 2. Surface Burning Characteristics - Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency:
 - a. Flame Spread Index: 25 or less.
 - b. Smoke Developed Index: 450 or less.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1. Solid Plastic (HDPE):
 - a. Scranton Products; Capitol Partitions, Comtec Industries. Basis of Design.
 - b. Accurate Partitions Corp.; ASI Group.
 - c. Ampco Products, LLC.
 - d. General Partitions Mfg. Corp.
 - e. Global Partitions; ASI Group.
 - f. Metpar Corp./Sanymetal
- B. Aluminum Castings: ASTM B26/B26M.
- C. Aluminum Extrusions: ASTM B221.
- D. Stainless Steel Sheet: ASTM A666, Type 304, stretcher leveled standard of flatness.
- E. Stainless Steel Castings: ASTM A743/A743M.

2.2 PARTITION COMPONENTS

- A. Solid Plastic Partitions:
 - 1. Style:
 - a. Toilet Partition: Floor anchored and overhead braced.
 - b. Entrance Screen Style: Floor supported and overhead braced.

- c. Urinal Screen Style: Floor anchored and overhead braced.
- B. Door, Panel, Screen, and Pilaster Construction - Solid, high density polyethylene (HDPE) panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges, no sightline system, and with homogenous color and pattern throughout thickness of material:
 - 1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
 - 2. Heat Sink Strip: Continuous, stainless steel strip fastened to exposed bottom edges of solid plastic components to hinder malicious combustion.
 - 3. Color and Pattern: Selected by Architect.
 - 4. Pilaster Shoes and Sleeves (Caps) - Stainless steel:
 - a. Pilaster shall be attached to the floor by means of an 11 gauge stainless steel footer, with provisions for leveling, attached to two (2) 3/8 inch diameter stainless steel studs set into expansion shields. The floor connections are to be covered by a four (4) inch high stainless steel shoe, #4 finish.
 - b. Option Panels: 1/2 inch thick solid phenolic core with high pressure color surface on faces. Edges shall be burnished and slightly rounded.
- C. Urinal Screen Post: Post design of stainless steel matching the thickness and construction of pilasters or 1-3/4 inch (44 mm) square, aluminum tube with satin finish; with shoe and sleeve (cap) matching that on the pilaster.
- D. Brackets (Fittings):
 - 1. Stirrup Type: Ear or U-brackets, stainless steel.
 - 2. Full Height (Continuous) Type: Stainless steel.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories - Heavy duty operating hardware and accessories:
 - 1. Hinges: Minimum 0.062 inch (1.59 mm) thick, full door length, stainless steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through bolts.
 - 2. Latch and Keeper: Heavy duty surface mounted cast stainless steel latch unit designed to resist damage due to slamming, with combination rubber faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through bolts.
 - 3. Coat Hook: Heavy duty combination cast stainless steel hook and rubber tipped bumper, sized to prevent in swinging door from hitting compartment mounted accessories. Mount with through bolts.
 - 4. Door Bumper: Heavy duty rubber tipped cast stainless steel bumper at out swinging doors and entrance screen doors. Mount with through bolts.
 - 5. Door Pull: Heavy duty cast stainless steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through bolts.
- B. Overhead Bracing: Continuous, extruded aluminum head rail with antigrip profile and in standard finish.
- C. Anchorages and Fasteners: Exposed fasteners of stainless steel, finished to match the being secured, with theft resistant type heads. Provide sex type bolts for through bolt applications. For concealed anchors, use stainless steel, hot dip galvanized steel, or rust resistant, protective coated steel compatible with related materials.

2.4 FABRICATION

- A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead Braced Units: Provide corrosion resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Floor Anchored Units: Provide corrosion resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Urinal Screen Posts: Provide corrosion resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.
- E. Door Size and Swings: Unless otherwise indicated, provide 24 inch (610 mm) wide, in swinging doors for standard toilet compartments and 36 inch (914 mm) wide, out swinging doors with a minimum 32 inch (813 mm) wide, clear opening for compartments designated as accessible.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

3.2 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the work. Confirm location and adequacy of blocking and supports required for installation. Proceed with installation after correcting unsatisfactory conditions.

3.3 INSTALLATION

- A. Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices:
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch (13 mm).
 - b. Panels and Walls: 1 inch (25 mm).
 - 2. Stirrup Brackets - Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel:
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
 - 3. Full Height (Continuous) Brackets - Secure panels to walls and to pilasters with full height brackets:
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless

otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position. Attach wall brackets into solid backing/blocking and/or wall studs. No drywall anchors allowed.

- C. Floor Anchored Units: Set pilasters with anchors penetrating not less than 2 inches (51 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact. Attach wall brackets into solid backing/blocking and/or wall studs. No drywall anchors allowed.

3.4 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out swinging doors to return doors to fully closed position.

3.5 MAINTENANCE MATERIAL

- A. Furnish extra materials that match products installed and packaged with protective covering for storage and identified with labels describing contents and source:
 - 1. Door Hinges: One hinge(s) with associated fasteners.
 - 2. Latch and Keeper: One latch and keeper(s) with associated fasteners.
 - 3. Door Bumper: One bumper(s) with associated fasteners.
 - 4. Door Pull: One door pull(s) with associated fasteners.
 - 5. Fasteners: Ten fasteners of each size and type.

END OF SECTION 10 21 13

SECTION 10 28 13

RESTROOM ACCESSORIES

Part 1 – General

A. Related Sections

1. 06 10 00: Rough Carpentry
2. 09 21 16: Gypsum Board Assemblies
3. 09 30 00: Tiling

B. Submittals

1. Samples
 - a. If requested by the District or Architect, submit full-size samples of specific units for review of design and operation. Acceptable samples will be returned and may be used in work.

Part 2 – Products

A. Faculty/Staff/Public Restroom

1. Paper Towel Dispenser
 - a. Bobrick B-262
 - b. ASI 0210
 - c. Bradley 250-15
2. Foam Soap Dispenser (OFCI)
 - a. Wxie GoJo 385781 2000 mL Dispenser
3. Toilet Paper Dispenser
 - a. Bobrick Classic Series B-2888 or approved equal
- b. Bobrick B-3888 or approved equal where recessed option is required
 - a.
2. Toilet Seat Cover Dispenser
 - a. Bobrick B-221
 - b. ASI 0477-SM
 - c. Bradley 5831
3. Mirrors
 - a. One-piece roll-formed, type 304 stainless steel angle framed mirror with continuous stiffener on all sides. No. 1 quality, ¼ inch select float glass mirror with type 430 stainless steel channel frame with bright polished finish.
4. Grab Bars
 - a. Heavy Duty, 18-gauge, 304 stainless steel tubing, welded with concealed mounting plate, and 22-gauge flange covers. The finish shall be peened nonslip gripping surface with satin finish.
5. Feminine Sanitary Napkin Disposal Receptacle in all Stalls
 - a. Wxie 820705, –Manufacturer Bobrick B-270

B. Student Restroom

1. Foam Soap Dispenser (OFCI)
 - a. K-8, MS, HS - Waxie 380003SA; Manufacturer Deb 98123 Stainless Steel Soap
 - b. Elementary - Waxie GoJo 385781 2000 mL Dispenser
 2. Toilet Paper Dispenser
 - a. Bobrick B-2888 or approved equal
 - b. Bobrick B-3888 or approved equal where recessed option is required
 3. Hand Dryers
 - a. Basis of Design: Excel XLERATOReco 1.1N
 - b. Accessories: Noise Reduction Nozzle; ADA recessed cabinet (when required)
 - c. Warranty: 7 Years
 - d. Or Approved Equal
 4. Feminine Sanitary Napkin Disposal Receptacle in all Stalls except dedicated preschool, TK and Kindergarten classrooms
 - a. Bobrick B-270 Contura Series
 - b. Or Approved Equal
 5. Feminine Hygiene Product Dispenser
 - a. Evogen EV1SS-Free (OFCI), Grades 6-12
 - b. Bobrick Classic B-3706-C (Free, No Coin/No Token) or Trimline B-37063-C (Free, No Coin/No Token) when recessed option is needed (CFCI)
 - c. Coordinate with District Representative to confirm if dispenser is required at Elementary Schools (TK-5) and if so location(s).
 6. Mirrors
 - a. Frameless, bright-polished stainless steel
 - b. Bobrick B-1556 or approved equal
 7. Grab Bars
 - a. Heavy Duty, 18-gauge, 304 stainless steel tubing, welded with concealed mounting plate, and 22-gauge flange covers. The finish shall be peened nonslip gripping surface with satin finish.
- C. Classroom or other Sink (non-restroom) – all grades**
1. Paper Towel Dispenser
 - a. Bobrick B-262
 - b. ASI 0210
 - c. Bradley 250-15
 2. Foam Soap Dispenser (OFCI)
 - a. Waxie GoJo 385781 2000 mL Dispenser
 3. Custodial Accessories
 - a. Provide stainless steel, type 304 shelf and mop and broom rack in custodial rooms

Part 3 – Execution

- A. Extend ceramic tile behind and above mirrors.

END OF DOCUMENT

SECTION 11 66 43 ELECTRONIC SCOREBOARD

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Related Sections
 - 1. 05 12 00 Structural Steel Framing
 - 2. 26 05 00 Common Work Results for Electrical
 - 3. 27 10 00 Structured Cabling

1.2 SUMMARY

- A. Section Includes:
 - 1. Single-sided LED scoreboard with integrated captions for softball and soccer.
- B. Reference Standards:
 - 1. Standard for Electric Signs, UL 48.
 - 2. Standard for CSA C22.2 #207.
 - 3. Federal Communications Commission Regulation Part 15.
 - 4. National Electric Code.

1.3 SUBMITTALS

- A. Product data: Submit manufacturer's product illustrations, data and literature that fully describe the scoreboards and accessories proposed for installation.
- B. Shop drawings: Submit drawings showing scoreboard cabinet, mounting points, electrical and low voltage locations.
- C. Maintenance data: Submit manufacturer's installation, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. For outdoor use.
- B. Source Limitations: Obtain each type of scoring equipment and electronic displays through one source from a single manufacturer.
- C. ETL listed to UL 48.
- D. NEC compliant.
- E. FCC compliant.
- F. ETL listed to CSA 22.2 #207.

1.5 WARRANTY

- A. Provide 5 years of no cost parts exchange including standard shipping on electronics parts and radios due to manufacturing defects.
- B. Provide toll-free service coordination.
- C. Provide technical online and phone support during Daktronics business hours.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Product delivered on site.
- B. Scoreboard and equipment to be housed in a clean, dry environment.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Nevco Scoreboards, 301 E Harris Ave., Greenville, IL 62246 or equal approved.

2.2 PRODUCT

- A. Basis of Design: Nevco Model 3685 Multisport Scoreboard.

2.3 SCOREBOARD

- A. General information:
 - 1. Dimensions: 8'-0" high, 24'-0" wide, 0'-8" deep.
 - 2. Base weight: 740 lb (125 kg) – options may increase weight.
 - 3. Base power requirement: 350 W – options may increase wattage.
- B. Construction:
 - 1. All-aluminum construction.
- C. Digits and Indicators:
 - 1. LED digit technology.
 - 2. LED digit colors: Amber
 - 3. Timing:
 - a. 24" high intensity amber LED digits.
 - b. Bidirectional up or down count. Numbers between 0:00-99:59. 1/10th seconds displayed during final minute.
 - 4. Team Scores:
 - a. 24" high intensity amber LED digits.
 - b. Displays between 0-99
 - 5. Time Outs Left:
 - a. 18" high intensity amber LED digits.
 - b. Displays 0-9
 - 6. Ball Possession Indicators:
 - a. High intensity Amber LED
 - b. One for each team shaped in the form of a football.
 - 7. Ball On:
 - a. 24" high intensity amber LED digits
 - b. Displays 0-99

8. To Go, Inches & Goal:
 - a. 24" high intensity amber LED digits.
 - b. Displays 0-99
9. Quarter:
 - a. 24" high intensity amber LED digits
 - b. Displays 0-99
10. Time of Day:
 - A. In place of displaying game time on the scoreboard, the "time out" time may be displayed or the "time of day".
11. Horn:
 - A. Sounds automatically at 0:00 for a minimum of (2) seconds. Can sound manually at anytime.

2.4 SCORING CONSOLE

- A. Console is a Nevco MPCW-7 controller.
- B. Scores multiple sports using the sport graphics.
- C. Sealed keypad with LED display.
- D. Handheld switches included.
- E. Provide CC-3 carrying case.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install scoring equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.
- B. Field Measurements: Coordinate scoreboard location and height with the customer. Verify dimensions by field measurements.
- C. Supply weight and mounting method for owner to verify that building structure is capable of supporting the scoreboard's weight in addition to the auxiliary equipment.

3.2 EXAMINATION

- A. Verify that mounting surface is ready to receive scoreboard. Verify that placement of conduit and junction boxes are as specified and indicated in plans and shop drawings.

3.3 INSTALLATION

- A. Power conduit, cables and outlet boxes to be provided and installed by the electrical contractor. Signal raceways, conduit and boxes to be provided by the electrical contractor. Electrical contractor is also responsible for any required wire and terminators between each scoreboard and control location.

- B. Mount scoreboards and interior displays to wall in location detailed and in accordance with manufacturer's instructions. Unit to be plumb and level.

3.4 INSTALLATION - CONTROL CENTER

- A. Provide boxes, cover plates and jacks as required to meet control specification requirements. Control cables to control panels shall be concealed.
- B. Test the operation of the scoreboard, controller and all control jacks; leave control unit in carrying case and other loose items with owner's designated representative.
- C. Conduct operator training on the scoreboard/controller operation

END OF SECTION 11 66 43

SECTION 11 68 33.23 ATHLETIC FIELD EQUIPMENT

PART 1- GENERAL

1.1 SUMMARY

- A. Work Included: Provide all equipment and materials, and do all work necessary to furnish and install the athletic equipment, as indicated on the drawings and as specified herein.
- B. Related Sections:
 - 1. 05 12 00 Structural Steel Framing
 - 2. 11 66 43 Electronic Scoreboard

1.2 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. National Federation of State High School Associations (NFHS)
 - 2. ASTM International
 - 3. Manufacturers Data and Recommended Installation Requirements

1.3 SUBMITTALS

- A. Manufacturers Product Data
 - 1. Provide manufacturers product data prior to actual field installation work, for Architects review.
- B. Shop Drawings
 - 1. Provide drawings of the manufacturers recommended installation and foundation requirements prior to actual field installation work, for Architects review.

1.4 QUALITY ASSURANCE

- A. Manufacturers warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

1.5 PRODUCT DELIVERY AND STORAGE

- A. Materials delivered to the site shall be examined for damage or defects in shipping. Any defects shall be noted and reported to the Owners representative. Replacements, if necessary, shall be immediately re-ordered, so as to minimize any conflict with the construction schedule. Sound materials shall be stored above ground under protective cover or indoors so as to provide proper protection.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Sportsfield Specialties
- B. Or Approved Equal

2.2 MATERIALS

- A. Scoreboard Wide Flange Column Padding:
 - 1. Scoreboard I-Beam Pad SBP16:
 - a. Height: 6'-0" tall
 - b. 19 oz. premium outdoor vinyl with high UV resistance. Color selection from manufacturer's standard colors.
 - c. 2" thick closed cell cross link foam
 - d. Hook and loop attachment flaps
 - e. Graphics: no graphics.
- B. Netting Post Padding:
 - 1. Netting Post Padding BSSPP6
 - a. Height: 6'-0" tall
 - b. 18 oz. outdoor vinyl with high UV resistance. Color selection from manufacturer's standard colors.
 - c. 3" thick high impact polyurethane foam
 - d. Hook and loop attachment flaps
 - e. Graphics: no graphics.
- C. Field Lighting Padding:
 - 1. Field Lighting Padding LPP16
 - a. Height: 6'-0" tall
 - b. 19 oz. premium outdoor vinyl with high UV resistance. Color selection from manufacturer's standard colors.
 - c. 2" thick closed cell cross link foam
 - d. Hook and loop attachment flaps
 - e. Graphics: no graphics

PART 3 - EXECUTION

3.1 INSTALLATION OF EQUIPMENT

- A. All post and column padding shall be installed as recommended per manufacturer's written instructions and as indicated on the drawings.

END OF SECTION

SECTION 11 68 53 OUTDOOR BASEBALL AND SOFTBALL EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Bases
 - 2. Pitching Rubber
 - 3. Home Plate
 - 4. Foul Poles
 - 5. Dugout Benches, Helmet/Bat Storage, Backpack Hangers/Hooks
 - 6. Padding
 - 7. Fence Guards
 - 8. Fence Screen
 - 9. Netting
- B. Related Sections:
 - 1. Section 03 30 00: Cast-In-Place Concrete
 - 2. Section 04 22 00: Concrete Unit Masonry

1.3 SUBMITTALS

- A. Product Data: Submit schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures, product variations, and accessories.
- B. Shop Drawings: Indicate size, material, and finish. Show locations and installation procedures. Include details of joints, attachments, and clearances.

1.4 WARRANTY

- A. Unless otherwise noted, warrant the work specified for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective, or nonconforming materials and workmanship.
- B. Foul Poles, Dugout Benches, Wall/Rail Padding: Warrant the work specified for three (3) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
- C. Fence Guard shall be warrantied for a minimum of five (5) years against cracking, breaking, and becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
- D. Defects shall include, but not be limited to, the following: Rough or difficult operation, noisy operation, loose or missing parts, noticeable deterioration of finish, etc.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in protective wrapping, store inside building protected from weather, moisture and soiling.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All materials shall be approved and installed in accordance with University Interscholastic League (UIL), the National Federation of State High School Association (NFHS), and/or NCAA rules/regulations (latest edition).

2.2 APPROVED MANUFACTURERS

- A. Specifications are based on named manufacturers. Except where stated as “No Substitutions”, manufacturers listed who produce equivalent products to those specified are approved for use on the Project. Other manufacturer’s must have a minimum of five (5) years’ experience manufacturing products equivalent to those specified and comply with Division 01 requirements regarding substitutions to be considered:
 - 1. Baseballracks.com, Evergreen Park, IL (708) 636-1047.
 - 2. Aalco Mfg. Co., St. Louis, MO; (800) 537-1259.
 - 3. Performance Sports Systems, Noblesville, IN; (800) 848-8034.
 - 4. Porter Athletic Equipment Co., Broadview, IL; (800) 947-6783.
 - 5. Promats Athletics, Salisbury, NC (800) 617-7125.
 - 6. Sportsfield Specialties Inc., Delhi, NY; (888) 975-3343.
 - 7. Pasadena Sporting Goods, Pasadena, TX; (713) 477-7151.
 - 8. Tomark Sports, Dallas, TX; (951) 371-1844.

2.3 BASEBALL/SOFTBALL EQUIPMENT

- A. Bases: Provide one (1) set of three (3) "Pro-Style Jack Corbett Hollywood Bases" complete with anchors and plugs by Schutt.
- B. Pitching Rubber: Provide one (1) 4-sided Pitching Rubber with interior aluminum tube by Schutt.
- C. Home Plate: Provide one (1) in-ground, “Hollywood Bury All” all-rubber home plate by Schutt.
- D. Foul Poles: Provide two (2) yellow powder coated aluminum Foul Poles with Wings, 30 feet in height at softball and baseball, manufactured by Sportsfield Specialties Inc. or approved equivalent.
- E. Dugout Equipment:
 - 1. Aluminum Bench: Single tier semi-permanent aluminum bench with backrest, attached to concrete slab. Manufactured by Sportsfield.com
ProStyle Benches: Corsair Bench c. Two tiered seating with angled back for comfort. Freestanding or can be attached to dugout. Treated wood frame capped off with treated pinewood premium grade decking. 2 coats of exterior enamel in color selected by Architect. Manufactured by Baseballracks.com
 - 2. Helmet/Bat Bin and Side Storage Cubby Combo: Versatile rack storing baseball and softball gears and bats. Custom as shown on drawings. Each section comes with “Satin Chrome” double coat hooks underneath. Available in one or two tone color scheme as selected by Architect. Manufactured by Epeus Solutions, hangaroundproducts.com., (909) 322-0043.

3. Backpack Hangers/Hooks: Stainless steel design durable and resistant to corrosion. Powder coated. Colors to be selected by Architect and District. Manufactured by Sportsfield.com, model SUAHHBSS or equal by Baseballracks.com.
- F. Padding:
1. Backstop Wall Padding:
 - a. Description: Panels shall be constructed of a 3 inch thick high density polyurethane padding attached to a 5/8 inch moisture resistant composite wood backer board and covered with an 18 ounce high UV extruded vinyl covering. For seasonal removal or repair, panels can be installed to walls with optional, extruded aluminum "Z" type clips. The "Z" clip attachment system provides a smooth and neat appearance and allows worn or vandalized pads to be removed for repair or replacement by simply lifting the panel upward.
 - b. Size: The size of the individual pads shall be approved by the owner prior to manufacturing.
 - c. Cover material shall have a tear strength of 100 P.S.I minimum, shall be mildew and rot resistant, and fortified with an infection combating fungicide. Cover material shall be in color selected by Architect from manufacturer's standard colors and shall have a Class A flame resistance according to ASTM E84.
 - d. All cutouts for electrical, etc., if any, shall be made in the field to fit job conditions.
 - e. Contractor shall be responsible for proper inspection and installation of panels.
 - f. Approved Manufacturer: Buck Terrell Athletics, BaseZone by Promats Athletics, or approved equivalent.
 2. Guard/Hand Rail Padding:
 - a. Description: Rail padding shall be manufactured using 1 inch high impact foam cores to provide a low pad profile. Rail pads are to be covered with an 18 ounce, UV resistant extruded vinyl. Rail pads are to be attached with cable ties through grommets.
 - b. Size: The Rail Pads shall be made to cover 1-1/2" to 2" diameter rails. The Rail Pads can either be rounded or square as noted on drawings. If not denoted, assume using rounded pads.
 - c. Approved Manufacturer: Buck Terrell Athletics, Promats Athletics or approved equivalent.
- G. Fence Guard:
1. Description: Fence Guard shall be a tear drop shape polyethylene cap designed to cover chainlink and other fencing. The Fence Guard shall be a 0.10" thick polyethylene cap treated for UV resistance.
 2. Contractor shall be responsible for proper inspection and installation.
 3. Approved Manufacturer: Promats Athletics or approved equivalent.
- H. Fence Screen:
1. Location: Outfield fence.
 2. Full height commercial grade custom printed fence screen on PVC maxflex mesh attached to chain link fabric. 311 series custom printed flex mesh. Manufactured by fencescreen.com, (949) 215-6313. Graphic design to be supplied by District. Fence screen applied to chain link fencing and gates, typ.

PART 3 EXECUTION

3.1 COORDINATION

- A. Coordination by all contractors and equipment manufacturers/suppliers for the work of this section shall be performed without delays or damage to parts of any work.

3.2 INSTALLATION

- A. Install items in accordance with manufacturer's instructions, and in locations shown on drawings or as directed by Owner/Consultant.
- B. Bases: Install bases in locations shown on drawings or directed as recommended by the manufacturer.
- C. Pitching Rubber: Install pitching rubber in location shown on drawings or as directed and recommended by the manufacturer.
- D. Home Plate: Install home plate in location shown on drawings or as directed and recommended by the manufacturer.
- E. Foul Poles: Install foul poles in location shown on drawings or as directed and recommended by the manufacturer.
- F. Dugout Equipment: Install/Attach bench pedestals in minimum 3000 psi concrete as instructed by manufacturer. Secure racks to wall/floor as directed by manufacturer. Install rubber mat flooring per manufacturers recommendations and cut/trim to provide tight fit.
- G. Wall Padding: Verify walls to which wall padding panels are attached are perfectly plumb or slightly convex (bowed out) over the area to be covered. If found to be not perfectly plumb or concave (bowed in), install sufficient shims at midsection of panels to provide plumb or convex wall profile. Panels must be inspected before installed. Install products under manufacturer's supervision and/or in accordance with manufacturer's instructions. Attach backstops securely to structure in locations shown on drawings. Locate hoists as shown or required. Install wall padding panels in locations shown on drawings with minimum amount of wrinkles in fabric in accordance with ASTM F2440. Make final adjustment after installation and clean all backstop support piping of dirt and other substances which may affect final finish. Lubricate all moving parts. Touch-up primer paint where damaged. Clean wall padding panels of dirt, grease and other substances detrimental to good appearance.
- H. Guard/Hand Rail Padding: Install on railing per manufacturers recommendation.
- I. Fence Guard: Install on top of fencing and attached per manufacturers recommendation. Color to be selected by Owner.

END OF SECTION 11 68 53

SECTION 13 34 16.53 BLEACHERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Information related to design and fabrication of Frame-Type Bleachers.

1.3 QUALITY ASSURANCE

- A. Confirm to 2022 California Building Code (CBC):
 - 1. Provide accessible seating per CBC Section 11B-221.
 - 2. Provide microphone outlets, spotter systems outlets, and football and track scoreboard outlets in accessible location.
 - 3. 2010 Americans with Disability Act (ADA), and all applicable local regulations.
- B. Contractor's Responsibilities:
 - 1. Contractor shall furnish and install the items required for proper completion of the Work without adjustment to price or schedule. To avoid any misunderstanding or lack of interpretation, the Contractor is hereby advised that the responsibility for the bleachers are totally his and that designs and resolutions proposed in the Contractor's shop drawings, structural calculations, and related documentation shall be demonstrated throughout the Work and warranty period specified or required.
 - 2. Work shall be of sound, quality construction and the Contractor shall be solely responsible for the inclusions of adequate labor and materials to cover the proper and timely fabrication and installation of the bleachers indicated, described, or implied.
 - 3. Design proposal submissions which follow exactly the details indicated on the Drawings, will not relieve the Contractor of his responsibility for the design, fabrication, erection, or performance of the Work of this Section. In the event of a controversy over the design, the decision of the Architect will take precedence.

1.4 WARRANTY

- A. Southern Bleacher (manufacturer of design) warrants its Frame-Type Bleacher to be free from defect in material and workmanship in the course of manufacturing for a period of one (1) year from Date of Substantial Completion for project installed by Southern Bleacher and beginning at Date of Initial Delivery of Product for Projects installed by others. Warrant excludes defects resulting from abnormal use, accidental or intentional damage, or any occurrences beyond manufacturer's control.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Specifications are based on products of listed manufacturer:
 - 1. Southern Bleacher Company, 801 Fifth St., Graham, TX 76450, 800-433-0912.
 - 2. Or Approved Equal.

2.2 FRAME-TYPE BLEACHERS

- A. Product Description:
 - 1. Silver Edition 3 Row Non-Elevated Frame-Type Bleachers:
 - a. Rise and Depth Dimensions: Vertical rise and horizontal depth per row: 11 inches x 26 inches. Seat is 17 inches above its respective tread.
 - b. Framework: Prefabricated angle bleacher frames are spaced at 6-foot (max.) intervals and connected by crossbraces.
 - c. Seats: Nominal 2 x 10 anodized aluminum plank with 2 x 10 anodized end caps.
 - d. Treads: Nose, deck, and heel planks with anodized end caps create a 26" tread depth condition. All treads are to be texture coated aluminum. Mill finish will not be accepted. Tongue and groove decking arrangement.
 - e. Risers: Nominal 1" x 8" anodized aluminum riser plank. Intermediate aisle steps: fully closed and constructed with interlocking deck extrusions.
 - f. Guardrailing: Two lines of aluminum rail with chain link 42 inches above seat on both sides of bleacher and across back of bleacher.
 - g. Aisle: Aisle to be provided with 34" high handrail and intermediate rail at approximately 22" above tread. Handrails with rounded ends are discontinuous to allow access to seating through a 24" wide space. Aluminum tread nosing of contrasting color on aisle steps.
 - 2. Wheelchair Area: Wheelchair area to be 5 ft 8 inches wide for two wheelchairs (33 inches each) and 36 inches for single wheelchair.
- B. Materials/Finishes:
 - 1. Framework:
 - a. Galvanized Steel: Structural fabrication with ASTM A529 steel. Shop connections are seal welded. After fabrication, all steel is hot-dipped galvanized to ASTM A123 specification.
 - 2. Extruded Aluminum:
 - a. Seat Planks, Riser Planks, and Step Risers: Extruded aluminum alloy 6063-T6, clear anodized 204R1, AA-M10C22A31, Class II, and a wall thickness of .094 inch.
 - b. Tread Plants: Extruded aluminum alloy 6063-T6, mill finish and wall thickness of .094 inch.
 - 3. Accessories:
 - a. Channel End Caps: Aluminum alloy 6063-T6, clear anodized 204R1, AAM10C22A31, Class II.
 - b. Hardware:
 - 1) Bolts, Nuts: Galvanized or plated.
 - 2) Hold-Down Clip Assembly: Aluminum alloy 6061-T6.
 - c. Guardrailing: Anodized aluminum rail 1-5/8 inches o.d. with galvanized chain link.
 - d. Crossbraces: Extruded aluminum angle allow 6061-T6, mill finish.
 - e. Aisle Nose: Aluminum alloy, 6063-T6, black powder-coat finish.
- C. Fabrication:
 - 1. Design Load:
 - a. Live Load: 100psf gross horizontal projection.
 - b. Lateral Sway Load: 24 plf seat plank.
 - c. Perpendicular Sway Load: 10 plf seat plank.
 - d. Live Load of Seat and Tread Plank: 120 plf.
 - e. Guardrail: 100 plf vertical and 50 plf horizontal.
 - 2. Connections:
 - a. All connections made in shop to be shop welded:
 - 1) Manufactured by certified welders conforming to AWS Standards.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install bleacher unit in accordance with manufacturer's installation procedures.
 - 1. Maximum separation on joints to be one-quarter inch (1/4") unless thermal expansion calculations suggest otherwise. Contractor to submit prior to installation.
 - 2. Spacing of material to be consistent through-out fabrication tolerances.
 - 3. Grind smooth all edge joints or exposed joints, exposed bolt heads or threads and rivet connection to minimize danger to users.
- B. Securely anchor frame-type, Silver Edition bleacher unit to a flat, level, concrete slab or heavy timber sliders.

END OF SECTION 13 34 16.53

Responsibility Matrix Long Beach Unifies School District – Poly High School				
Description	General Contractor	Modular Contractor	Others	Comments
Division 01 – General Requirements:				
<u>All Work Within the Perimeter of the Modular Building</u>		X		Low voltage, design, and installation.
<u>All Work Outside the Perimeter of the Modular Buildings Not Specifically Identified Below</u>	X			
Full-Time Supervision for Crew Onsite	X			
Temporary Facilities:				
Temporary Site Fencing	X			
Field Office for Inspector and CM	X			Optional field office and Space.
Temporary Power Service	X			
Gas and Electrical Utility Charge for Start-Up and Testing	X			
Temporary Water	X			
Temporary Fire Water	X			
Division 02 – Existing Conditions:				
Site Demo and Excavation	X			
Rough Grading	X			
Finish Grading and Re-Grading After the Form Work is Removed by the Modular Contractor	X			Modular Contractor to coordinate ALL utilities hook-up with Site Contractor
Site Fencing	X			
Asphalt Concrete:				
Driveways/Parking	X			
Walkways	X			
Striping	X			

Description	Site Contractor	Modular Contractor	Others	Comments
Site Concrete:				
Mow Strips	X			
Site Flat Work	X			Modular Contractor to coordinate with Site Contractor for placement of stairs and Ramps, including bottom of ramp/stair accessible pads.
Curb and Gutter	X			
Condenser Pads (if applicable)	X			Modular Contractor to coordinate with Site Contractor for placement.
Storm Drains:				
Site	X			
Storm Drain to RWL	X			
Connect RWL to SD	X			
Gas Service:				
Gas Service to Meter Incl. Trenching	N/A			
Gas Service to Meter	N/A			
Gas Meter	N/A			
Gas Line to Buildings	N/A			
Housekeeping Pad for Gas Meter (if applicable)	N/A			
Regulator at Buildings	N/A			
SOV at Buildings	N/A			
Domestic Water:				
Water Service to Meter Inc. Trenching	X			
Water Service to Meter	X			
Water Service (within 5' of buildings)	X			
SOV at Buildings	X			
Connect to Buildings	X			
Chlorination – Site Lines	X			

Description	Site Contractor	Modular Contractor	Others	Comments
Chlorination – Building Lines	X			
Sanitary Sewer:				
Site to Modular POC	X			
Cleanouts at POC	X			
Connections at Building	X			
Division 03 – Concrete:				
Building Slab:				
Design (Geotech Report by Others)		X		
Over-Excavation and Pad Prep with Certified Pad	X			
Surveying and Foundation Staking	X			
Dig Footings	X			
Off-Haul Footing Spoils	X			
Footings and Required Stem Walls	X			GC RESPONSIBLE TO PROVIDE AND INSTALL EMBEDS (REF 10/F2.50)
Retaining Walls	X			
Division 05 – Metals:				
Design		X		
Steel Framing		X		
Stair Structures (if applicable)				N/A
DI Grates	X			
DF Rails on New Building	X			
DF Rails at Site DFs	X			
Canopies, Trellis'		X		
Division 06 – Wood, Plastics, and Composites:				
Wall Framing		X		
Building Insulation		X		
Interior Trim		X		
Exterior Stucco System		X		

Description	Site Contractor	Modular Contractor	Others	Comments
Division 07 – Thermal and Moisture Protection:				
Roofing:		X		
Gutters and Downspouts		X		
Roof Drains/Scuppers		X		MODULAR CONTRACTOR TO COORDINATE WITH GENERAL CONTRACTOR FOR PLACEMENT
Skirt Flashing	X			
Division 08 – Openings:				
Doors and Hardware		X		
Windows		X		INCLUDING TRANSACTION WINDOW
Storefront/Curtain Walls (if required)				N/A
Skylights (Solatubes)				N/A
Roll-Up Doors		X		
Room Partitions		X		
Division 09 – Finishes:				
Acoustic Ceilings		X		
Drywall		X		
Ceramic Tile (if required)		X		
FRP Wall Finish (if required)		X		
Lath and Plaster (if required)		X		
Wood or Hardie Siding (if required)				N/A
Tackboard (if required)				N/A
Flooring – Carpet/VCT/Lino		X		
Finish Painting		X		
Division 10 – Specialties:				
Site Sunshades				N/A
Toilet Partitions		X		TO BE PROVIDED BY SCM
Toilet Accessories		X		TO BE PROVIDED BY SCM
Building Fire Extinguishers		X		TO BE PROVIDED BY SCM

Description	Site Contractor	Modular Contractor	Others	Comments
Building ID and ADA Signage	X			
Division 11 – Equipment:				
Food Service Equipment	X			
Projection Screens				N/A
Laboratory Equipment				N/A
Division 12 – Furnishings:				
Casework and Countertops		X		
Window Coverings (if required)				N/A
Furniture				N/A
Division 13 – Special Construction:				
Modular Buildings:				
Design and Engineering, Structural, and MEP		X		
Manufacture Buildings		X		
Deliver, Set, and Connect Including Welding		X		
All Finishes		X		
Elevator (if required)				N/A
Division 23 – Heating, Ventilating, and Air Conditioning (HVAC):				
Design		X		
HVAC Equipment		X		
All Building Plumbing and Trim		X		
Condensate Drain and Drywell	X			
Drinking Fountains at Modular Buildings		X		
Freestanding Drinking Fountains	X			

Description	Site Contractor	Modular Contractor	Others	Comments
Energy Management System/BMS	X			PATHWAY TO BE PROVIDED BY SCM
Fire Sprinkler Design (if required)				N/A
Fire Sprinkler System (if required)				N/A
Fire Service – Underground to Above Floor				N/A
Fire Riser				N/A
Flow and Tamper Switches				N/A
Site Hydrants	X			N/A
Division 26 – Electrical:				
Design – Power and Lighting		X		
Transformers in Building (if required)	X			
MDP in Building		X		
Subpanels in Building		X		
Power Feeders to Buildings	X			Coordinate with Modular Contractor.
Power in Building, Plugs/Switches		X		
Lighting		X		BUILDING LIGHTING (GC TO PROVIDE SITE LIGHTING AND MUSCO)
Grounding, Install and Test	X			
Site Power, Power to Building and Site Lighting	X			
Integration and Networking to BMS	X			
Solar System/Array				N/A
Telephone/Telecom Systems:				
Design				
Empty Conduit and Back Boxes in Building		X		
Conduit to Building	X			

Telephone System and Testing		X		SCM TO PROVIDE PATHWAY
Description	Site Contractor	Modular Contractor	Others	Comments
Data:				
Design				
Empty Conduit and Back Boxes in Building		X		
Conduit to Building	X			
Data Equipment and Cabling	X			
IDF Cabinet	X			
Power for IDF		X		
Clock/Bell/Intercom:				
Design				
Empty Conduit and Back Boxes in Building		X		
Conduit to Building	X			
Equipment and Cabling	X			
Fire Alarm:				
Design				
Empty Conduit and Back Boxes in Building		X		
Conduit to Building	X			
All Fire Alarm Control and Annunciator Panels	X			
Power for FACP/FAEP (in modular buildings)		X		
Security System:				
Design				
Empty Conduit and Back Boxes in Building		X		
Description	Site Contractor	Modular Contractor	Others	Comments
Cameras and Equipment	X			

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

CONDITIONS OF THE CONTRACT AND DIVISION 01, as applicable, apply to this Section.

PART 1 GENERAL

1.1 SUMMARY

- A. Provide all work for electrical systems required in the project to be properly installed, tested, and performing their intended function.

1.2 QUALITY ASSURANCE

- A. Perform all work in accordance with the latest edition of the California Electrical Code.
- B. All electrical materials and distribution, and utilization equipment shall be UL Listed.
- C. All equipment and materials shall be new and unused and of United States Domestic manufacture unless approved otherwise by engineer or owner.
- D. Eliminate any abnormal sources of noise that are considered by the architect not to be an inherent part of the electrical systems as designed.

1.3 COORDINATION WITH OTHER TRADES

- A. Coordinate the work of this division with all other divisions to ensure that all components of the electrical system will be installed at the proper time and fit the available space.
- B. Locate and size all openings in work of other trades required for the proper installation of the electrical system components.
- C. Make all electrical connections to all equipment furnished by this division and any other division.
- D. Make all electrical connections from all 120 volt and greater dampers and switches to associated exhaust fan(s) furnished by any other division.

1.4 DRAWINGS

- A. The drawings are schematic in nature but show the various components of the systems approximately to scale and attempt to indicate how they are to be integrated with other parts of the building. Determine exact locations by review of equipment manufacturer's data, by job site measurements, by checking the requirements of other trades, and by reviewing all Contract Documents. The size of the electrical equipment indicated on the Drawings may be based on the dimensions of a particular manufacturer. While other listed manufacturers will be acceptable, it is the responsibility of the Contractor to determine if the equipment that Contractor proposes to furnish will fit in the space. The drawings are not intended to show exact locations of conduit and wire, or to indicate all wire terminators, connectors, conduit fittings, boxes or supports, but rather to indicate distribution, circuitry, and control.
- B. The Electrical Drawings are necessarily diagrammatic in character and cannot show every connection in detail or conduit in its exact location. These details are subject to the requirements of ordinances and also structural and architectural conditions. The Contractor

shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Work shall be installed to avoid crippling of structural members. All exposed work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted.

- C. When the mechanical and electrical Drawings do not give exact details as to the elevation of pipe, conduit, and ducts, physically arrange the systems to fit in the space available at the elevations intended with the proper grades for the functioning of the system involved. Exposed conduit is generally intended to be installed true and square to the building construction and located as high as possible against the structure in a neat and workmanlike manner. The Drawings do not show all required offsets and their location details. Work shall be concealed in all finished areas.

1.5 SUBMITTALS

- A. Specification Review:
 - 1. Include a paragraph-by-paragraph written specification review for each product listed requiring a submittal. Denote any proposed deviations from specifications.

1.6 EXISTING CONDITIONS

- A. Do all work required to maintain electrical services to the Owner occupied portions of the building during construction.
- B. No connection to existing services or utilities shall be made without Owner's knowledge and permission. All such connections shall be planned and scheduled to minimize the length of service interruption required. Request for shutdown shall be made to Owner at least two (2) weeks in advance and shall be accompanied by detailed written schedule of activities during shutdown and list of materials required for connection and renewal of service. It shall be understood that all such service interruptions shall be made at the Owner's convenience, not the Contractor's. No increase in contract amount will be allowed for reasons of premium time, inefficiency of operations or other considerations not calculated in original bid.
- C. All items removed shall be stored on-site. Schedule a review of the items with the Owner. Remove from site all items the Owner does not choose to keep. Deliver Owner designated items to Owner's storage facility.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.
- C. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.

PART 2 EXECUTION

2.1 EXISTING WORK

- A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
- B. Provide temporary wiring and connections to maintain existing systems in service during construction.
- C. When performing work on energized equipment or circuits, use personnel experienced and trained in similar operations.
- D. Remove, relocate, and extend existing installations to accommodate new construction.
- E. Repair adjacent construction and finishes damaged during demolition and extension work.

2.2 OWNER INSTRUCTION

- A. Provide on-site Owner training for all new equipment.
- B. Use Operation and Maintenance manuals and actual equipment installed as basis for instruction.
- C. At conclusion of on-site training program have Owner personnel sign written certification they have completed training and understand equipment operation. Include copy of training certificates in final Operation and Maintenance manual submission.
- D. Supply record drawings to the district in PDF and the latest version of AutoCAD.

END OF SECTION 26 05 00

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Wires and cables rated for 600 volts or less.
 - 2. Connectors, splices, and terminations rated for 600 volts or less.
 - 3. Lugs and pads rated for 600 volts or less.
- B. System Description:
 - 1. Provide wires, cables, connectors, lugs, strain reliefs, racking insulators for a complete and operational electrical system.
- C. Reference Standards:
 - 1. California Electrical Code (CEC). California Code of Regulations, Title 24, Part 3.
 - 2. National Electrical Manufacturers Association (NEMA):
 - a. WC 70 Power Cables Rated 2,000 V or Less for the Distribution of Electrical Energy.
 - 3. National Electrical Testing Association (NETA):
 - a. ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
 - 4. Underwriters Laboratories, Inc. (UL):
 - a. 83 UL Standard for Safety Thermoplastic-Insulated Wires and Cables.
 - b. 486 Standard for Wire Connectors.
 - 5. American Society for Testing and Materials (ASTM):
 - a. B1 Standard Specification for Hard-Drawn Copper Wire.
 - b. B3 Standard Specification for Soft or Annealed Copper Wire.
 - c. B8 Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

1.3 SUBMITTALS

- A. Provide product data for the following equipment:
 - 1. Wires.
 - 2. Cables.
 - 3. Connectors.
 - 4. Lugs.
 - 5. Splice Kits.
- B. Provide the insulation cable testing report in the project closeout documentation, refer to Closeout Requirements in the General Conditions portion of this specification.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Confirm to requirements of the CEC, latest adopted version.

2. Furnish products listed by UL or other testing firm acceptable to AHJ.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Wires and Cables:
 1. Southwire Company
 2. Encore Wire Corporation
 3. Cerro Wire and Cable Co.
 4. General Cable Corp.; a brand of Prysmian Group
 5. Okonite Co.
 6. Alan Wire
 7. LS Cable and System USA
 8. American Wire and Cable
- B. Connectors:
 1. FCI Burndy Corp.
 2. Cooper Crouse Hinds.
 3. O.Z./ Gedney Co.
 4. Thomas & Betts Co.
 5. 3-M Co.
 6. Ideal Industries Co.
 7. Polaris Electrical Connectors
 8. ILSCO
- C. Wire connectors shall be minimum 75 degree centigrade rated and properly sized for the number of conductors being connected, terminated, spliced etc. All above grade connectors shall be solderless lug or plastic wire nut type, screw on, pressure cable type (wire nut or spring nut type), 600 Volt, 105-degree C, with skirt to cover all portions of stripped wires. Connector shall be U.L. rated for number and size of conductors being joined together as a splice.
- D. Splices:
 1. Branch Circuit Splices: Ideal, Scotch-Lock, 3M, or approved.
 2. Feeder Splices: Compression barrel splice with two layers Scotch 23 and four layers of Scotch 33+ as vapor barrier.
 3. Screw Terminal Lugs.
 4. Kearney Split Bolt.

2.2 WIRES AND CABLES FOR LINE VOLTAGE SYSTEM AND CONTROLS.

- A. Wire and Cable Shall Be:
 1. Copper, 600 volt rated throughout. Conductors 12AWG to 10AWG, solid or stranded. Conductors 8AWG and larger, stranded.
 2. Phase color to be consistent at all feeder terminations; A-B-C, top to bottom, left to right, front to back. Phasing tape shall be permitted on sizes #6 and larger.
- B. Each phase wire shall be uniquely color-coded as indicated below:
 1. 120/ 240 Volts
Phase A – Black
Phase B – Red
Neutral – White
Ground – Green

2. 120/ 208 Volts
Phase A – Black
Phase B – Red
Phase C – Blue
Neutral – White
Ground – Green
 3. 277/ 480 Volts
Phase A – Brown
Phase B – Orange
Phase C – Yellow
Neutral – White or Natural Gray
Ground – Green
 4. Isolated Grounds: Green with Yellow Stripes
- C. All conductors shall be copper unless otherwise noted. Minimum size for individual conductors shall be #12 AWG unless otherwise noted. Sizes #8 AWG and larger shall be stranded conductor. Individual conductors shall be insulated with type, XHHW, THW, THHN/ THWN 600- volt insulation unless otherwise noted. Control, signal, communication conductors shall be as dictated by the vendor of that equipment or as specified here-in. Proper insulation type shall be used for the proper environmental application (i.e., waterproof, wet location, plenum, temperature rated). If a condition exists where the application is uncertain, contact the Engineer for direction. Contractor is responsible to follow specific cabling requirements described in other sections of this specification relative to various communications and controls systems as well as the respective riser diagrams shown on plans. If a discrepancy occurs, communicate such discrepancy to the Architect and Engineer immediately for resolution.
- D. Insulation types THWN, THHN or XHHW. Minimum insulation rating of 90C for branch circuits.
- E. Refer to signal and communications specification sections for cable requirements.

2.3 CONNECTORS

- A. Copper Pads: Drilled and tapped for multiple conductor terminals.
- B. Lugs: Indent/ compression type for use with stranded branch circuit or control conductors.
- C. Solid Conductor Branch Circuits: Spring connectors, wire nuts, for conductors 12 through 8AWG.

2.4 LUGS AND PADS

- A. Ampacity: Cross-sectional area of pad for multiple conductor terminations to match ampere rating of panelboard bus or equipment line terminals.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Installation: Conductors shall not be installed until after conduit systems are permanently in place. Use an approved non-hardening type wire pulling lubricant if lubricant is to be used. Maintain all conduits and wire pulls free from foreign material. If due to field conditions, more than a total of 300 degrees of bend are required; a pull box shall be furnished and installed

for ease of installation. Said pull boxes must be sized and rated for the appropriate application and must remain easily accessible upon completion of the project (approval of the location shall be obtained from the Architect prior to installation). Show these pullboxes on the field record drawings. Conductors installed in underground raceways on site shall be duct sealed and taped where they exit the raceway to prevent the entrance of foreign material and moisture after the conductors are installed. Proper drainage shall be provided for underground pull and splice boxes.

- B. Insulation: Use proper insulation types where temperature and environment are a factor.
- C. Labeling: All conductors in panels, switchboards, terminal cabinets, vaults, pull boxes, and junction boxes shall be labeled with tape number markers indicating circuit number and identifying system. All labeling shall be permanent. See Section 26 05 53: Identification of Electrical Systems.
- D. All conductors, wiring, cable where installed below floor, slab or underground shall be considered wet locations, and shall be rated accordingly. Non-waterproof cabling is not allowed in any below grade or wet application.
- E. Cables routed together in cable tray shall be stacked, organized and tie wrapped together in a neat and workman like manner. Random cable routing is not acceptable.
- F. Cable and conductors routed through pull boxes and vaults shall be properly supported. Bend radius of cable or conductor shall not be less than six times the overall cable diameter.
- G. Wires and Cables:
 - 1. Conductor Installation:
 - a. Install conductors in raceways having adequate, code size cross-sectional area for wires indicated.
 - b. Install conductors with care to avoid damage to insulation.
 - c. Do not apply greater tension on conductors than recommended by manufacturer during installation.
 - d. Use of pulling compounds is permitted. Clean residue from exposed conductors and raceway entrances after conductor installation.
 - 2. Conductor Size and Quantity:
 - a. Install no conductors smaller than 12AWG unless otherwise shown (e.g. – Fire alarm and communications systems, as defined in their respective specifications sections and/ or drawings).
 - b. Provide all required conductors for a fully operable system.
 - 3. Provide dedicated neutrals (one neutral conductor for each phase conductor). Exceptions may only be granted with Electrical Engineer approval.
 - 4. Conductors in Cabinets:
 - a. Cable and train all wires in panels and cabinets for power and control neatly and uniformly. Use plastic ties in panels and cabinets.
 - b. Tie and bundle feeder conductors in wireways of panelboards.
 - c. Hold conductors away from sharp metal edges.

3.2 FIELD QUALITY CONTROL

- A. Field inspection and test shall be performed under provisions of NETA ATS section 7.3 (2) - Low Voltage Cables, 600-Volt Maximum as follows:
 - 1. Visual and Mechanical Inspection:
 - a. Compare cable data with drawings and specifications.
 - b. Inspect exposed sections of cable for physical damage and correct connection in accordance with single-line diagram.

- c. Inspect all bolted electrical connections for high resistance using one of the following methods:
 - 1) Use of low-resistance ohm-meter in accordance with NETA section 7.3.2.2 (Electrical Tests).
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data from NETA ATS Table 10.12.
- d. Inspect compression-applied connectors for correct cable match and indentation.
- e. Verify cable color coding with applicable specifications and CEC.
- 2. Electrical Tests
 - a. Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. Test duration shall be one minute.
 - b. Perform resistance measurements through all bolted connections with low-resistance ohmmeter, if applicable, in accordance with Section 7.3.2.1 (Visual and Mechanical Inspection).
 - c. Perform continuity test to insure correct cable connection.
 - d. Correct malfunctions and/ or deficiencies immediately as detected at no additional cost to the District, including additional verification testing.
 - e. Subsequent to final wire and cable terminations, energize all circuitry and demonstrate functional adequacy in accordance with system requirements.
- 3. Test Values
 - a. Compare bolted connection resistance to values of similar connections.
 - b. Bolt-torque levels should be in accordance with NETA ATS Table 10.12 unless otherwise specified by the manufacturer.
 - c. Micro-ohm or milli-volt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.
 - d. Minimum insulation-resistance values should not be less than 50 meg-ohms.
 - e. Investigate deviations between adjacent phases.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Grounding and bonding requirements of electrical installations for personnel safety and to provide a low impedance path for possible ground fault currents as described in CEC Article 250.
 - 2. "Grounding electrode system" refers to all electrodes required by CEC, as well as including made, supplementary, lightning protection system and telecommunications system grounding electrodes.
 - 3. The terms "connect" and "bond" are used interchangeably in this specification and have the same meaning.
- B. Related Sections:
 - 1. Section 26 05 00: Common Work Results for Electrical.
 - 2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.
- C. Reference Standards:
 - 1. California Electrical Code (CEC). California Code of Regulations, Title 24, Part 3.
 - 2. Institute of Electrical and Electronics Engineers (IEEE):
 - a. 81 IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.
 - b. 142 Recommended Practice for Grounding of Industrial and Commercial Power Systems.
 - c. 1100 Recommended Practice for Powering and Grounding Electronic Equipment
 - 3. National Electrical Testing Association (NETA):
 - a. ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems
 - 4. Underwriters Laboratories, Inc. (UL):
 - a. 83 UL Standard for Safety Thermoplastic-Insulated Wires and Cables.
 - b. 467 Grounding and Bonding Equipment.
 - 5. American Society for Testing and Materials (ASTM):
 - a. B1 Standard Specification for Hard-Drawn Copper Wire.
 - b. B3 Standard Specification for Soft or Annealed Copper Wire.
 - c. B8 Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

- A. Equipment grounding conductors shall be UL 83 insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG and larger shall be permitted to be identified per CEC.

- B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes No. 10 AWG and smaller shall be ASTM B1 solid bare copper wire.
- C. Conductor sizes shall not be less than what is shown on the drawings and not less than required by the CEC, whichever is greater.

2.2 SPLICES AND TERMINATION COMPONENTS

- A. Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper; 3/4 inch by 10 feet (19 mm by 3 m).
- B. Ground Plates: 1/4 inch (6 mm) thick, hot-dip galvanized.
- C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes shall be at least 12 inches (300 mm) deep, with cover.
 - 1. Install at least one test well for each service unless otherwise indicated. Install the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

PART 3 EXECUTION

3.1 GENERAL

- A. Ground in accordance with the CEC, as shown on drawings, and as hereinafter specified.
- B. System Grounding:
 - 1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformers.
 - 2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.
- C. Equipment Grounding: Metallic structures (including ductwork and building steel), enclosures, fire sprinklers, plumbing piping, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be bonded and grounded.

3.2 INACCESSIBLE GROUNDING CONNECTIONS

- A. Make grounding connections which are buried or otherwise normally inaccessible (except connections for which periodic testing access is required) by exothermic weld.

3.3 SECONDARY EQUIPMENT AND CIRCUITS

- A. Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.
- B. Metallic Piping, Building Steel, and Supplemental Electrode(s):
 - 1. Provide a grounding electrode conductor sized per CEC between the service equipment ground bus and all metallic water and gas pipe systems, building steel, and supplemental or made electrodes. Jumper insulating joints in the metallic piping. All

- connections to electrodes shall be made with fittings that conform to UL 467.
2. Provide a supplemental ground electrode and bond to the grounding electrode system.
- C. Service Disconnect: Provide a ground bar bolted to the enclosure with lugs for connecting the various grounding conductors.
- D. Switchgear, Switchboards, and Motor Control Centers:
1. Connect the various feeder equipment grounding conductors to the ground bus in the enclosure with suitable pressure connectors.
 2. For service entrance equipment, connect the grounding electrode conductor to the ground bus.
 3. Connect metallic conduits, which terminate without mechanical connection to the housing, by grounding bushings and grounding conductor to the equipment ground bus.
- E. Transformers:
1. Exterior: Exterior transformers supplying interior service equipment shall have the neutral grounded at the transformer secondary. Provide a grounding electrode at the transformer.
 2. Separately derived systems (transformers downstream from service equipment): Ground the secondary neutral at the transformer. Provide a grounding electrode conductor from bar at the service equipment.
- F. Conduit Systems:
1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor sized per CEC.
 2. Nonmetallic conduit systems shall contain an equipment grounding conductor, except that non-metallic feeder conduits which carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment need not contain an equipment grounding conductor.
 3. Metal conduit containing only a grounding conductor, and which is provided for mechanical protection of the conductor, shall be bonded to that conductor at the entrance and exit from the conduit.
- G. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders, power, and lighting branch circuits.
- H. Boxes, Cabinets, Enclosures, and Panelboards:
1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes.
 2. Provide lugs in each box and enclosure for equipment grounding conductor termination.
 3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.
- I. Motors and Starters: Provide lugs in motor terminal box and starter housing or motor control center compartment to terminate equipment grounding conductors.
- J. Receptacles shall not be grounded through their mounting screws. Ground with a jumper from the receptacle green ground terminal to the device box ground screw and the branch circuit equipment grounding conductor.
- K. Ground lighting fixtures to the equipment grounding conductor of the wiring system when the green ground is provided; otherwise, ground the fixtures through the conduit systems. Fixtures connected with flexible conduit shall have a green ground wire included with the

power wires from the fixture through the flexible conduit to the first outlet box.

- L. Fixed electrical appliances and equipment shall be provided with a ground lug for termination of the equipment grounding conductor.

3.4 CONDUCTIVE PIPING

- A. Bond all conductive piping systems, interior and exterior, to the building to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.

3.5 TELECOMMUNICATIONS SYSTEM

- A. Bond telecommunications system grounding equipment to the electrical grounding electrode system. Refer to communications backbone cabling specification section.

3.6 GROUND RESISTANCE

- A. Grounding system resistance to ground shall not exceed 15 ohms. Make necessary modifications or additions to the grounding electrode system for compliance without additional cost to the Owner. Final tests shall assure that this requirement is met, and test results shall be submitted to the Owner with final close out documents.
- B. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in IEEE Standard 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.
- C. Below-grade connections shall be visually inspected by the Inspector of Record (IOR) prior to backfilling. The Contractor shall notify the IOR 24 hours before the connections are ready for inspection.
- D. Furnish a copy of tests to Owner at completion of project.

END OF SECTION 26 05 26

SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
1. Conduit and fittings.
 2. Outlet boxes.
 3. Weatherproof outlet boxes.
 4. Junction and pull boxes.
 5. Floor boxes.
 6. Cabinets, termination cabinets.
 7. Gutters.

1.3 SUBMITTALS

- A. Provide Product Data for the Following Equipment:
1. Conduit and fittings.
 2. Outlet boxes.
 3. Weatherproof outlet boxes.
 4. Junction and pull boxes.
 5. Floor boxes.
 6. Cabinets, termination cabinets.
 7. Gutters.
 8. Putty pads.
 9. Raceways
- B. Submit detailed conduit routing plan, for review and approval, prior to installation as follows:
1. Exposed and/ or concealed in building walls for conduits larger than 2-inch outside diameter.
 2. All underground conduits (3/4-inch and larger) in duct bank; concealed in floor slabs, equipment pads and concrete slabs.

1.4 SUBMITTALS

- A. Minimum acceptable conduit sizes are summarized in the following table:

	Minimum Size
Underground, site wiring	1"
Underground <ul style="list-style-type: none">• Building Wiring Aboveground <ul style="list-style-type: none">• Equipment or panel feeders• Telecommunications	3/4"
Aboveground <ul style="list-style-type: none">• Lighting or branch circuit wiring• Fire alarm• Security	1/2"

Other	3/4"
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1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 1. Conform to requirements of the CEC, latest adopted version.
 2. Furnish products listed by UL or other independent and nationally recognized testing firm.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- B. Protect PVC and PVC-coated metallic conduit from sunlight.
- C. Protection of and cleanliness of pathways and raceways must be assured during the construction process in order to eliminate the possibility of debris entering the conduit, duct, pathway resulting in decreased wire capacity and potential damage to installed conductors and cables.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Polyvinyl Chloride (PVC) coated galvanized rigid steel conduit and intermediate metal conduit shall be in accordance with NEMA RN 1. Coating shall be applied under controlled factory conditions. Prior to coating, conduit shall meet requirements of ANSI C80.1 and UL 6 or ANSI C80.6 and UL 1242 as appropriate. PVC coated conduits shall have ultra-violet (UV) inhibitor in the coating material.
- B. Intermediate Metal Conduit (IMC). Raceway shall be hot dipped galvanized mild steel in accordance with ANSI C80.6 and UL 1242 and shall bear the UL label. Conduit shall have same characteristics of rigid steel except for thinner wall.
- C. Galvanized Rigid Steel Conduit (GRSC or RGS), couplings and elbows shall be hot dip galvanized, rigid mild steel in accordance with ANSI C80.1 and UL 6. The conduit interior and exterior surfaces shall have a continuous zinc coating with a transparent overcoat of enamel, lacquer, or zinc chromate. Conduit shall be formed with continuous welded seams with a uniform wall thickness, in minimum 10-foot lengths, with threaded ends.
- D. Electrical Metallic Tubing (EMT). Electrical metallic tubing, including elbows and bends, shall be zinc coated, mild steel in accordance with the requirements of ANSI C80.3 and UL 797. The interior and exterior surfaces of the tubing shall have a continuous zinc coating. Conduit shall be formed with a continuous welded seam, with a uniform wall thickness, in minimum 10-foot lengths.
- E. Non-Metallic Conduit shall be as follows:
 1. Schedule 40: Conduit shall be 90 degree Celsius, polyvinyl chloride in conformance with NEMA TC-2 and UL 651 requirements.
 2. Spacers used in duct bank installations shall be high impact plastic, interlocking bases, and intermediate type spacers. Place spacers between 6 and 10 feet apart.

- F. Flexible Metal Conduit shall be galvanized steel meeting the requirements of UL 1. Flexible aluminum conduit is not permitted.
- G. Liquid-Tight Flexible Metal Conduit shall be plastic jacketed, galvanized steel, "Sealtite" Type EF for general service areas or Type HC for high temperature when used under raised floor or in air plenums. Conduit shall be UL listed.
- H. Manufacturers:
 - 1. Outlet Boxes: Bowers, Raco, Orbit, Steel City or equal.
 - 2. Weatherproof Outlet Boxes: Bell, Red Dot, Carlon or equal.
 - 3. Floor Boxes: Wiremold/ Walker, Hubbell, Steel City, or equal.
 - 4. Junction and Pull Boxes: Circle AW, Hoffman, Wireguard or equal.
 - 5. Box Extension Adapter: Bell, Red Dot, Carlon or equal.
 - 6. Conduit Fittings: O-Z Gedney, Thomas & Betts, Raco, Crouse Hinds, or equal.
 - 7. Putty pads: 3M, Hilti, or equal.
 - 8. Heavy wall rigid non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
 - 9. Extra heavy wall non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
 - 10. Flexible Metal Conduit (FMC), Alfex, American Flexible Conduit or equal.
 - 11. Liquid tight flexible metal conduit, Anacanda (type UA), Electri-flex Liqueatite or equal.
 - 12. Floor Boxes, Single Gang, Walker/ Wiremold 880 CS Series or approved equal.
 - 13. Floor Boxes, Multiple Gang, Walker/ Wiremold RFB Series or Walker Omnibox multi-service floor box with carpet plates, and/ or water resistant device covers.
 - 14. Masonry Boxes, outlets in concrete, Raco Series 690 or equal.
- I. Listed products for termination, coupling, extending, benching supports of raceways shall be used.

2.2 OUTLET BOXES

- A. NEMA 1 gutter, junction and pull boxes shall be fabricated from code gage steel finished in grey enamel with screw cover fronts and concentric knockouts in all sides.
- B. NEMA 3R gutter, junction and pull boxes shall be fabricated from code gage galvanized steel with screw cover fronts and concentric knockouts in the bottom only. Any penetrations to the side, top or back shall be weatherproofed in an approved manner such as "MYERS" gasketed type hub or equal.
- C. Steel outlet boxes and plaster rings shall be galvanized rigid assemblies, either one piece pressed or factory welded construction containing the size and number of knockouts required. Steel outlet boxes shall be manufactured, sized and installed in accordance with CECArticle 314. Device Outlet: Installation of one or two devices at common location, minimum 4" square, minimum 1-1/2" deep. Single or 2 gang flush device plaster ring. Raco or equal.
- D. Luminaire Outlet: minimum 4" square with correct plaster ring depth, minimum 1-1/2" deep with 3/8" luminaire stud if required. Provide proper depth plaster ring on bracket outlets and on ceiling outlets.
- E. Construction: Provide galvanized steel interior outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices. Boxes shall be properly secured to the structure such that they are flush with the finish surface. Boxes shall be made structurally secure by means of the proper fastening devices.

- F. Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, plaster rings, luminaire studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.

2.3 JUNCTION AND PULL BOXES

- A. Construction: Provide galvanized sheet steel junction and pull boxes, with screw-on covers; of the type shape and size, to suit each respective location and installation; with welded seams and equipped with steel nuts, bolts, screws and washers.
- B. Location:
 - 1. Install junction boxes above accessible ceilings for drops into walls for receptacle outlets from overhead.
 - 2. Install junction boxes and pull boxes as required to facilitate the installation of conductors and limiting the accumulated angular sum of bends between boxes, cabinets and appliances to 300 degrees.
 - 3. Locations: Junction boxes shall be located only where necessary and only in equipment rooms, closets, and accessible attic and underfloor spaces. A horizontal distance of 24" shall separate outlet boxes on opposite sides of occupancy separation walls, fire-rated walls or partitions.
 - 4. Labeling: Junction box covers shall be marked with indelible ink indicated the circuit numbers passing through the box.

2.4 CONDUIT FITTINGS

- A. Requirements: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and plastic conduit bushings of the type and size to suit each respective use and installation.
- B. Steel boxes may allow for field knock-out modifications, but shall in all other ways conform to code requirements.

2.5 FLOOR BOXES - SINGLE GANG

- A. Construction: Deep cast iron fully adjustable before and after concrete pour with all required components for complete activation. Verify required components for application of service fittings, covers, monuments, and the like, attached to floor boxes.
- B. Activations:
 - 1. Flush: Provide brass duplex or single signal cover, hinged with set screw lock. Carpet or tile finish ring.
 - 2. Monuments: Provide stainless steel monuments with power receptacle or data grommet as noted.
 - 3. Coordinate specific application of systems as noted on Drawings.

2.6 FLOOR BOXES - MULTIPLE GANG

- A. Construction: Deep cast iron, fully adjustable before and after pour. Equal to Walker/ Wiremold RFB Series or Walker Omnibox multi-service floor box with carpet plates, and/ or water resistant device covers. Verify color. Partition for different power or signal applications. Provide required power receptacle devices and signal grommets or receptacles as noted. Flange type shall be compatible with floor covering for either carpet or vinyl as required and shall be brass type not polycarbonate.

- B. Floor mounted boxes shall be water tight and cast iron when installed in grade level concrete slab floor, fully adjustable with interior and exterior leveling screws. Receptacle flange shall be brass with a duplex lift lid. Flange type shall be compatible with floor type. Before installation, coordinate exact location with Architect.

2.7 PUTTY PADS

- A. Intumescent moldable firestop putty designed to protect electrical outlet boxes.
- B. Provide putty pads of proper type around outlet boxes and/ or as detailed on plan to meet sound transmission restrictions and fire ratings of walls

2.8 PULLBOXES AND HANDHOLES

- A. Construction: High densities precast reinforced concrete box, extension, base, and cover. Furnish box with end and side knockouts and non-settling shoulders. Cover shall have hold-down bolts and two lifting eyes.
- B. Size: As indicated on the Drawings.
- C. Cover markings: Covers shall read "ELECTRICAL", "COMMUNICATIONS", or "SIGNAL" as appropriate.
- D. Rated covers: Use cast iron lid with H20 traffic rating when subject to vehicular traffic.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Conduit systems listed below are for use in installations where they are permitted to be used by CEC and/ or other occupancy restrictions. The below installation methods do not intend to suggest that these materials be installed in conflict with any applicable code. Special attention to applications shall be made in building types such as wet location, hazardous locations, assembly occupancy and multi-story, but not limited to these. Requirements which are more restrictive than the CEC may be called for by the drawings and/ or these specifications. These requirements must be adhered to. The Electrical Contractor shall be responsible to use the proper conduit system for the application. Exposed conduit is not allowed below ceilings or above slab of floor, without prior approval from Electrical Engineer. All conduits shall be concealed except in electrical and telecommunication rooms or where shown to be surface mounted. Exposed conduit (where allowed) shall be run square and plumb with building lines in an approved manner. Support roof mount conduits, where allowed, with minimum 12" wide approved rooftop supports (B-Line Durablok or approved equal) unless otherwise detailed in roof requirements or as specified in roofing specification. Strap conduits to blocks with proper sized conduit straps. Spacing of support shall be a minimum as provided for in the CEC. All exposed conduit mounted below 8' above finished grade shall be strapped at a minimum of 5' spacing.
- B. Non-Metallic Rigid Conduit shall be used in concrete slabs, below concrete slabs on grade, or underground outside of a building slab or foundation. Maintain minimum depth requirements and cover with appropriate fill material. Conduit shall be heavy wall Schedule 40 or 80, rigid PVC only. Rigid utility P&C duct shall not be used in any application. Properly sized grounding conductors shall be installed per CEC article 250, in all non-metallic conduit branch circuit and feeder runs. PVC conduit shall be formed or field bent only with the use of properly approved bending tools such as to not decrease the internal bore of the conduit. All

conduits shall be cut square and reamed of burrs. Approved and compatible glue shall be used on all PVC fittings to attain watertight joints.

- C. Galvanized Rigid Steel (GRS) conduit shall be used where exposed less than 8'-0" above finished grade to 18" below finished grade and where subject to physical damage. Conduits shall be cut square and reamed to remove burrs and sharp edges. Strap conduit below 8' above grade at 5' intervals. Unless otherwise noted, threadless setscrew and threadless weathertight fittings may be used in lieu of threaded fittings. All threaded ends entering a junction box of any type shall require one locknut on the inside and one on the outside of the enclosure and be provided with a plastic bushing or grounding bushing where necessary for proper grounding. Where exposed to moisture, a watertight hub or other approved method shall be required. All conduits shall be stubbed up straight and uniform into junction boxes, panels, cabinets, etc., and shall be (GRS) properly supported and strapped. All GRS conduit located below grade, shall be tape wrapped.
- D. Electrical Metallic Tubing (EMT) shall be used as allowed by code and as permitted by this specification. It shall not be in contact with soil or the concrete slab on the ground floor of any structure. Connectors and couplings shall be steel insulated set screw type where installed in indoor dry locations not subject to moisture. Where the potential for moisture is present, compression type weathertight fittings are required. One hole conduit straps are permitted from 1/2" to 1" and two hole conduit straps are required for size 1-1/4" and larger. EMT shall not be allowed in areas subject to severe physical damage. Install copper ground wire sized per CEC 250-122 in all EMT conduits.
- E. Flexible conduit may be used where concealed in building construction or above dropped ceilings, but shall meet the following criteria: No individual circuit path from distribution panel to last device shall exceed a cumulative length of 6' of flexible conduit from start to end. Flexible conduit shall not exceed a total directional change of 270 bending degrees in any one run between conduit terminations. Squeeze type or Jake type steel flex fittings of a grounding type are required. Flexible conduit must be supported in accordance with CEC. Where exposed to the weather, moisture, or spray down flexible conduit shall be of the liquidtight type. Fittings shall be manufactured for use with liquidtight flexible conduit. All motor connections shall be made with liquidtight flex. Flexible conduit may not be used where exposed except for last 2' of equipment connection and unless otherwise noted or approved. A copper ground wire sized per CEC 250-122 shall be installed in all flexible conduit runs. Flexible conduit may not be used exposed. Weatherproof liquid tight conduit shall not be used at roof level for equipment connections with lengths exceeding 24" nor shall it be used to circumvent a rigid conduit system in a horizontal direction. Connect recessed lighting fixtures to conduit runs with a maximum of 6' of flexible metal conduit extending from junction box to fixture.
- F. Underground conduits and transition to above grade/ slab shall be as follows:
 - 1. PVC elbows 2" and smaller are allowed, or if top of elbow is minimum 18" BFG or below top of slab, otherwise GRS elbows are required.
 - 2. GRS risers are required from elbow below grade to equipment (device, outlet, panel, cabinet, etc.) above grade.
 - 3. GRS elbows/risers to be PVC coated or 10 MIL tape wrapped (1/2" lapped) to 3" above finish grade or top of slab.
- G. Conduit Supports: Conduit runs may be supported by one-hole and two-hole straps or supports as manufactured by Unistrut, Minerallac, Caddy or equals. Supports may be fastened by means of anchors, shields, beam clamps, toggle bolts, or other approved methods appropriate for the application and size of conduit. Pipe nailers (J-hooks) may only be used for 1" conduit and smaller and only in wood frame construction. Conduit support methods are subject to review by the engineer and authority having jurisdiction for

adequacy. Installations deemed inadequate shall be corrected by the contractor at no cost to the Owner.

- H. Bends and offsets shall be made with approved tools for the type of conduit being utilized. Bends shall be made without kinking or destroying the smooth bore of the conduit. Parallel conduits shall be run straight and true with bends uniform and symmetrical. Minimum radii shall be per CEC 344-24.
- I. Conduit Stub-outs below grade shall be capped with plastic cap, and identified by placing a pull box marked with correctly identified utility such as "Elec", "Tel", etc. Dimension for exact location on field record drawings. Provide lids for proper field application (i.e. traffic, incidental, pedestrian).
- J. Conduit Seals - Where below grade conduits enter structure through slab or retaining wall of building or basement, seal the inside of each conduit as follows:
 - 1. Provide damming material around conductors 3" into conduit. Polywater or equal.
 - 2. Fill 3" of conduit with 3M #2123 sealing compound.
 - 3. Wrap conductors where they exit the conduit with 3M #2229 "Scotch Seal" mastic tape. Lap tape to approximate diameter of the raceway and wrap outside of conduit opening with (minimum) one turn.
 - 4. Use conduit sealing bushings type CSB (O-Z/ Gedney) or equal.
 - 5. Empty conduits shall be sealed with standard non-hardening duct seal compound and then capped to prevent entrance of moisture and gases and to meet fire resistance requirements.
 - 6. Provide cable drip loop minimum 12" high.
- K. Marker tape: Place marker tape at 12" below finish grade along and above buried conduits. Label tape "CAUTION: ELECTRICAL LINES BELOW" or similar wording.
- L. Electrical and communications systems raceways routed underground shall not occupy the same trench as plumbing utilities such as sewer, water, storm drain, gas or other wet or dry gaseous utility system. A minimum of 12" of undisturbed earth is required. Where utilities must cross in closer proximity to each other due to physical constraints, 6" minimum crossing distances are allowed.
- M. Conduits, routed below footings, slabs, grade beams, columns, and other structural elements shall be installed in strict compliance with structural details and criteria shown on structural plans. Clearances below structural elements and sleeves through structural elements must be carefully planned to avoid conflict and must be approved by the structural engineer if conflict arises.
- N. All conduit or raceways passing through fire rated walls, floors, or ceilings shall be installed with a listed penetration method which protects the opening to the same rating as the assembly and is non hardening.
- O. Location: Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.
- P. Anchoring: Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.
- Q. Special Application: Provide weatherproof outlets for locations exposed to weather or moisture.
- R. Knockout Closures: Provide knockout closures to cap unused knockout holes where blanks have been removed.

- S. Mount outlet boxes, unless otherwise required by ADA and CBC, or noted on drawings, the following distances above the finished floor:
 - 1. Receptacles, Telephone, TV & Data outlets. (measured to bottom of outlet box): +15".
 - 2. Outlet above counter (measured to top of outlet box): +46".
 - 3. Control (light) Switches. (measured to top of outlet box): +48".
 - 4. Fire Alarm Manual Pull Stations, T-stats. (measured to top of outlet box): +48".
 - 5. Fire Alarm Visuals: the lower of +80" to bottom of lens, or 6" below ceiling.
 - 6. Other Outlets: As indicated in other sections of specifications or as detailed on drawings.
- T. Coordinate all electrical device locations with the architectural floor plan and interior and exterior elevations to prevent mounting devices within elements that they may conflict such as cabinetry, mirrors, planters, etc.
- U. Size outlet and junction boxes to minimum wire fill space requirements. Upsize box as required to allow ease of wire installation and device installation.
- V. Outlet and junction boxes in fire rated walls shall be gauged and spaced so as not to exceed the maximum penetration allowed by the assembly without compromising the fire rating. If a conflict arises relative to a specific condition, the contractor shall follow the requirements of the fire authority and ask for guidance from the design team. At no time should a larger box be installed prior to resolution of conflict.

END OF SECTION 26 05 33

SECTION 26 05 53 - IDENTIFICATION OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Nameplates and warning signs where specified herein and as shown on contract documents including the following:
 - a. Nameplates and warning signs permanently installed on all electrical equipment and devices including, but not limited to, the following items:
 - 1) Enclosures for transformers, switchboards, motor control, panels, pullboxes, cabinets, motors, generators, transfer switches.
 - 2) Enclosures for all separately enclosed devices including, but not limited to, disconnect switches, circuit breakers, contactors, time switches, control stations and relays, fire alarm panels and lighting control panel.
 - 3) Wall switches not within sight of outlet controlled.
 - 4) Special systems such as, but not limited to, telephone, fire alarm, warning, and signal systems. Identification shall be at each equipment rack, terminal cabinet, control panel, annunciator and pullbox.
 - 5) Devices mounted within and part of equipment including circuit breakers, switches, control devices, control transformers, relays, indication devices and instruments.
 - 2. Conductor and Cable Identification.
- B. Related Sections:
 - 1. Section 26 05 00: Common Work Results for Electrical.
 - 2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.
 - 3. Section 26 20 00 Electrical Distribution Equipment.
- C. Reference Standards:
 - 1. California Electrical Code (CEC). California Code of Regulations, Title 24, Part 3.
 - 2. National Fire Protection Agency (NFPA):
 - a. 70E Standard for Electrical Safety in the Workplace.
 - 3. American National Standards Institute (ANSI):
 - a. A13.1 Pipe Markers.
 - b. Z535 Standards for Safety Signs and Labels.
 - 4. Underwriters Laboratories, Inc. (UL):
 - a. 969 Standard for Marking and Labeling Systems.
 - 5. Code of Federal Regulations, Title 29, Part 1910:
 - a. 144 Safety color code for marking physical hazards.
 - b. 145 Specifications for accident prevention signs and tags.

PART 2 PRODUCTS

2.1 EQUIPMENT LABEL DESIGNATIONS

- A. Equipment labels indicating equipment designations both emergency and normal.

Designation per drawings or to be supplied with shop drawings approval.

- B. Panelboard labels showing panel designation, voltage, phase, and source.
- C. Distribution panels, transformers, safety switches, transfer equipment, etc. Labels shall be per ANSI Z535.4 guidelines.

2.2 MATERIALS

- A. For Labels: Three layer laminated plastic or micarta with engraved white letters over black background.
- B. For Emergency Equipment: Use engraved white letters over red background.
- C. For Warning Signs: Minimum 18 gauge steel with red lettering on white porcelain enamel finish.
- D. Arc flash labels shall be provided as required by CEC Article 70E.
- E. Conductor tape number markers: TayMac MX4280 Series non-fading permanent adhesive.

PART 3 EXECUTION

3.1 MOUNTING

- A. Equipment labels shall be mounted by self-tapping, threaded screws, and bolts, or by rivets. Adhesive types are not acceptable unless specifically noted in this section.
- B. Conductor tape markers shall be consistently placed for ready conductor identification.

3.2 HEIGHTS ON LABELS

- A. Panelboards, Switchboards and Motor Control Centers and Special Systems Enclosures: 1/4" identify equipment designation; 1/8" identify voltage rating and source.
- B. Individual Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, and Motor Control Centers: 3/16" identify circuit and load served, including location of equipment.
- C. Enclosed Circuit Breakers, Enclosed Switches, and Motor Starters: 3/16" identify load served.
- D. Transformers: 3/16" identify equipment designation; 1/8" identify primary and secondary voltages, primary source, and secondary load. Include location of primary source or secondary load if remote from transformer.

3.3 WARNING SIGNS

- A. Warning signs shall be permanently mounted with cadmium plated steel screws or nickel-plated brass bolts.
- B. Warning signs to read "DANGER - HIGH VOLTAGE", with letters 1-1/2" high, 3/16" stroke minimum.

- C. Provide warning sign on all doors or immediately next to door for equipment rooms, enclosures or closets containing equipment energized above 150 volts to ground as per CEC, and/ or as directed by the Architect. For interior finish spaces and interior doors, signage shall be coordinated and approved with the Architect in advance of installation.

END OF SECTION 26 05 53

SECTION 26 20 00 - ELECTRICAL DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Conditions of the Contract Documents and Division 01 - General Requirements as applicable, apply to this Section.

1.2 SUMMARY

- A. Provide all electrical distribution and motor control equipment and accessories required to distribute electrical power to all motors, outlets and systems requiring power.

1.3 QUALITY ASSURANCE

- A. New: Provide all new equipment.
- B. Single Manufacturer: All equipment of each type shall be the product of one manufacturer.
- C. UL: Equipment shall be UL listed. Service entrance equipment shall bear UL Service Entrance label.
- D. CEC: Equipment and installation shall comply with the California Electrical Code.
- E. Wet Locations: Equipment and enclosures installed outdoors and in wet locations shall be approved for this purpose.
- F. IEEE: Institute of Electrical and Electronics Engineers Standard 1015-1997 (Blue Book) Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.

1.4 LABELING

- A. Nameplates and labeling shall be provided in accordance with Section 26 05 53. All feeders shall be labeled on the feeder device.

1.5 FINISHES

- A. All equipment shall have a factory applied gray finish applied over a rust inhibiting treatment. Any items which have the finish marred shall be touched up or refinished to a new condition before final acceptance. This shall include, but shall not be limited to, sanding and properly removing rust or other contaminants and completely repainting equipment if damage is extensive. Overall acceptance is subject to approval of the Engineer.

1.6 SUBMITTALS

- A. Provide complete product data for each equipment type. Provide electric service studies when required.
- B. Submittal shall include written recommendation from manufacturer of settings for all electronic trip adjustment setting on all equipment furnished with adjustable trip settings. Contractor is responsible for adjusting all electronic trip settings per manufacturer recommendations.

- C. Electrical connections to all equipment furnished by any other division shall be coordinated with final approved equipment submittals from other divisions including but not limited to circuit breaker sizes, conduit sizes, wire sizes, fuse sizes, disconnect switch sizes and starter sizes that differ from those shown on the drawings prior to submitting Electrical Distribution Equipment submittal.

1.7 SHORT CIRCUIT CURRENT RATINGS

- A. General: All switchboards and panelboards shall be fully rated and marked with a maximum short circuit current rating. The equipment manufacturer shall have verified this rating with high-amperage testing. All short circuit current ratings are expressed as amperes RMS symmetrical at the applied voltage unless otherwise noted. All equipment shall withstand the specified level of fault current. All overcurrent devices shall interrupt the specified level of fault current.

1.8 ELECTRIC SERVICE STUDIES

- A. Standard: Submit studies in accordance with ANSI/ IEEE Standard 242 Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
- B. Submit one-line diagram for each electrical service. Key all equipment and components on diagram to items in the studies.
- C. Provide a short-circuit current analysis for each main switchboard. Short-circuit analysis shall calculate short-circuit levels at service transformer secondary, switchboard main breaker, each feeder breaker and all levels of downstream distribution equipment. Assume infinite source bus.
- D. Provide a time-current coordination study for each main switchboard. Coordination study shall compare the operating levels and times of the protective devices to the withstand levels and times that the equipment can sustain without damage or failure. Determine electronic trip unit settings necessary to achieve optimal selective coordination between 480 volt main service circuit breakers and first level of feeder distribution devices. Determine setting for all adjustments of trip units of all electronic circuit breakers that are linked by zone-selective-interlocking. Furnish time-current curves for the two (or more) levels of distribution protected with electronic trips, plus the first additional distribution level served from the switchboard feeder. Show a separate composite plot for each feeder breaker trip rating with the main breaker. Plot composite time-current curves on log-log background. Add a typical frame size of downstream molded-case circuit breaker to each switchboard feeder composite plot.
- E. Provide arc-flash calculation and labeling for equipment in the project.
- F. The contractor shall make all adjustments to circuit breakers per electric service study and provide written documentation that all adjustments have been made.

1.9 OWNER'S INSTRUCTION

- A. Provide a four-hour period of instruction to the Owner's designated personnel upon completion of the main switchboard's installation. Review manufacturer's recommended switchboard maintenance. The Operations and Maintenance Manual shall be complete and on-site at the time of Owner instruction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Unless indicated otherwise, all equipment in this section shall be provided by a single manufacturer. The product designations listed are to establish a level of quality. Acceptable manufacturers are:
 - 1. Square D.
 - 2. Siemens.
 - 3. G.E.
 - 4. Cutler-Hammer.

2.2 ENCLOSED SWITCHES

- A. General: Provide heavy duty enclosed switches similar to Square D Class 3100 Type HD.
- B. Switch Interior:
 - 1. All switches shall have switchblades which are visible when the switch is OFF and the cover is open.
 - 2. Lugs shall be front removable and UL Listed for 75 degrees Celsius conductors.
 - 3. All current carrying parts shall be plated to resist corrosion.
 - 4. Switches shall have removable arc suppressors to facilitate easy access to line side lugs.
 - 5. Switches shall have provisions for a field installable electrical interlock.
- C. Switch Mechanism:
 - 1. Switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.
 - 2. The operating handle shall be an integral part of the box, not the cover.
 - 3. Provisions for padlocking the switch in the OFF position with at least three padlocks shall be provided.
 - 4. The handle position shall travel at least 90 degrees between OFF and ON positions to clearly distinguish and indicate handle position.
 - 5. All switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override, but the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.
- D. Switch Enclosures:
 - 1. Switch covers shall be attached with welded pin-type hinges.
 - 2. The enclosure shall be finished with gray baked enamel paint, which is electrodeposited on cleaned, phosphate pre-treated steel.
 - 3. The enclosure shall have ON and OFF markings stamped onto the cover.
 - 4. The operating handle shall be provided with a dual colored, red/ black position indication.
 - 5. All switches shall have provisions to accept up to three (3) 3/8-inch hasp padlocks to lock the operating handle in the OFF position.
 - 6. Tangential knockouts shall be provided to facilitate ease of conduit entry.
- E. Switch Ratings:
 - 1. Switches shall be horsepower rated for ac and/ or dc as indicated on the plans.
 - 2. The UL Listed short circuit current rating of the switches shall be 200,000 rms symmetrical amperes when used with or protected by Class J fuses.
 - 3. Non-Fusible: 10,000 rms symmetrical amps.

- F. Fuse Clips: NEMA FU 1, Class J fuses.

2.3 SINGLE CIRCUIT BREAKERS WITH ENCLOSURES

- A. Product Description: Enclosed, molded-case circuit breaker conforming to NEMA AB 1, suitable for use as service entrance equipment where applied.
- B. Circuit Breakers: Molded case, quick make, quick break, trip free, common thermal magnetic trip.
- C. Ratings: Continuous current, poles as required, 480 volt system breaker shall interrupt short circuits up to 14,000 rms amps symmetrical; on 120/ 208 - 240 volt system, 10,000 amp rms symmetrical.
- D. Enclosure: NEMA AB 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R.
- E. Nameplate: Provide a nameplate showing load served.

2.4 FRACTIONAL HORSEPOWER MANUAL MOTOR CONTROLLER

- A. Square D - Class 2510 Type F:
 - 1. Description: NEMA ICS 2, ac general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light and toggle operator.
 - 2. Enclosures: ANSI/ NEMA ICS 6, Type as indicated.

2.5 MAGNETIC MOTOR CONTROLLERS

- A. Square D - Class 8536 Type S:
 - 1. Description: NEMA ICS 2, ac general-purpose Class A magnetic controller for induction motors rated in horsepower.
 - 2. Coil Operating Voltage: Provide as required to interface with controls system, including control power transformer.
 - 3. Coil: Be of encapsulated type.
 - 4. Poles: as indicated.
 - 5. Size: as indicated.
 - 6. Contacts: Totally enclosed, double-break, silver-cadmium-oxide power contacts. Contact inspection and replacement shall be possible without disturbing line or load wiring.
 - 7. Wiring: Straight-through wiring with all terminals clearly marked.
 - 8. Overload Relay: NEMA ICS:
 - a. Solid State: Trip current rating will be established by selection of overload relay and shall be adjustable (3 to 1 current range). The overload shall be self-powered. Provide phase loss, phase unbalance protection, permanent tamper guard, Trip Class 10 or 20 and a mechanical test function.
 - b. Outputs: Units shall be designed for addition of either a normally open or normally closed auxiliary contact and shall be field convertible. Provide one (1) set of N.O. and N.C. contacts in each starter.
 - c. Reset: Unit shall include both manual reset and remote reset using an external module.

- d. Select overload current setting based on the motor nameplate data of the actual motor to be protected. All standard NEMA sizes may be used for the overload relay, including Size 00.
- 9. Enclosure: ANSI/ NEMA ICS 6, Type 1, 3R or 4X.
- 10. Control Power Transformers: 120 volt secondary. VA minimum, in each motor starter. Provide fused primary and secondary.
- 11. Provide red LED running pilot light and H-O-A switch.

2.6 MAGNETIC MOTOR CONTROLLERS - TWO - SPEED

- A. Square D - Class 8810 Type S:
 - 1. Description: Include integral time delay transition between FAST and SLOW speeds. Starters shall be electrically and mechanically interlocked to prohibit both starters being energized simultaneously.
 - 2. Coil operating voltage: Provide as required to interface with controls system, including control power transformer.
 - 3. Coil: Be of encapsulated type.
 - 4. Poles: as indicated.
 - 5. Size: as indicated.
 - 6. Contacts: Totally enclosed, double-break, silver-cadmium-oxide power contacts.
 - 7. Contact inspection and replacement shall be possible without disturbing line or load wiring.
 - 8. Wiring: Straight-through wiring with all terminals clearly marked.
 - 9. Overload Relay: NEMA ICS.
 - a. Solid State: Trip current rating will be established by selection of overload relay and shall be adjustable (3 to 1 current range). The overload shall be self-powered. Provide phase loss, phase unbalance protection, permanent tamper guard, Trip Class 10 or 20 and a mechanical test function.
 - b. Outputs: Units shall be designed for addition of either a normally open or normally closed auxiliary contact and shall be field convertible. Provide one (1) set of N.O. and N.C. contacts in each starter.
 - c. Reset: Unit shall include both manual reset and remote reset using an external module.
 - d. Select overload current setting based on the motor nameplate data of the actual motor to be protected. All standard NEMA sizes may be used for the overload relay, including Size 00.
 - 10. Enclosure: ANSI/ NEMA ICS 6, Type 1, 3R or 4X.
 - 11. Two speed motor controllers shall be designed for type of motor winding specified in Division 23 Mechanical Specifications, Drawings, or Equipment Schedule. Coordinate with Division 23 prior to submittal.
 - 12. Provide red-high, amber-low running pilot lights and H-O-L-A switch.
 - 13. Provide two speed motor controllers for all two speed motors specified in Division 23 Mechanical Specifications, Drawings, or Equipment Schedule. Coordinate with Division 23 prior to submittal.

2.7 COMBINATION DISCONNECT/ MOTOR STARTERS

- A. Square D - Class 8538 Type S (Fusible or no fuse, as shown on plans):
 - 1. Description: Combine magnetic motor controllers with fusible switch disconnect in common enclosure. The switch shall have a color coded externally operated handle. Operating handle shall give positive visual indication of ON/ OFF with red and black color-coding.
 - 2. Fusible Switch Assemblies: NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate Class J fuses and visible blades.

Operating handle shall give positive visual indication of ON/ OFF with color-coded operating handle.

3. Magnetic Motor Controllers: Refer to paragraph(s) specifying magnetic motor controllers for requirements.

2.8 FUSES (600 VOLTS AND BELOW)

- A. Manufacturers:
 1. Bussmann.
 2. Little Fuse.
 3. Ferraz Shawmut.
- B. Dimensions and Performance: NEMA FU 1, Class as specified or as indicated on Drawings.
- C. Voltage: Rating suitable for circuit phase-to-phase voltage.
- D. Class J (Time Delay) Fuses:
 1. Dimensions and Performance: NEMA FU 1.
 2. Voltage: Rating suitable for circuit phase-to-phase voltage.
 3. Dual-element, time delay ten (10) seconds (minimum) at 500 percent rated current.
- E. Spares: Spare fuses shall be provided in the amount of ten (10) percent of each type and size installed. Replacement for fuses and limiters blown during construction shall not count as spares.

2.9 BRANCH CIRCUIT PANELBOARDS

- A. Product Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.
- B. Panelboard Bus: Copper current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.
- C. For non-linear load applications subject to harmonics furnish 173 percent rated, plated copper, solid neutral.
- D. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical for 208-240/ 120 volt panelboards; 22,000 amperes rms symmetrical for 480 volt panelboards.
- E. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.
- F. Enclosure: NEMA PB 1, Type 1 or Type 3R. All panelboards located in kitchen areas shall be flush mount with NEMA 4X Stainless Steel enclosures.
- G. Cabinet Front: Safety dead front type with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finish in manufacturer's standard gray enamel.
- H. Provide ground-fault circuit breaker for each heat trace branch circuit.

- I. Panelboards indicated to have thru-feed lugs shall be furnished with thru-feed lugs in all sections of panelboard.

PART 3 - EXECUTION

3.1 MOUNTING

- A. General: All equipment shall be securely fastened in place.
- B. Locations: In all cases mounting locations shall comply with the requirements of the California Electrical Code. This shall include providing suitable working clearances.
- C. Concrete Pads:
 - 1. Provide concrete in accordance with the Division of the Specifications for that product.
 - 2. Indoor concrete pads shall consist of a four (4) inch pad with beveled edges extending two (2) inches beyond the perimeter of supported equipment. Switchboards, motor control centers, transformers greater than 15 KVA, and engine generators shall be installed on a pad. Refer to the drawings and the specifications for each piece of equipment to determine what other equipment shall be mounted on a pad.
 - 3. All equipment, ground mounted outdoors, shall be mounted on a pad. Outdoor pads shall be minimum of one foot thick reinforced with #4 rebar one (1) foot on center each way. Size outdoor pads with at least four (4) feet working clearance in front of equipment and one (1) foot on all sides. Provide anchor bolts for pad-mounted equipment. Refer to Detail on drawings.
- A. Wall Mounted Equipment: Wall mounted equipment shall be suitably positioned on the wall. Equipment mounted on the exterior basement wall shall have unistrut channels between the wall and the equipment to prevent condensation problems. Where wall mounted equipment is specified, but a convenient wall not available, a suitable unistrut mounting stanchion anchored in concrete shall be provided. In lieu of this stanchion, small devices may be mounted on to the equipment served if approved by the equipment manufacturer.
- B. Motor rated disconnects: Install disconnects in a vertical orientation with off in the down position.

3.2 DELIVERY, STORAGE AND HANDLING

- A. General:
 - 1. Store all types of electrical power distribution equipment in a clean, heated building affording appropriate physical protection. Control access to prevent unauthorized tampering with the equipment. However, equipment may be stored in other inside or outside environments under approved conditions.
 - 2. Inspect equipment when received at Project site for shipping damage. Report as required by freight carrier to recover repair or replacement costs from the freight carrier in the event damage was sustained.
 - 3. Covers are required unless indoor, ventilated storage conditions exist. Canvas tarpaulins or the equivalent are preferred over other coverings because they provide better humidity control and enclosure scuff protection. Where exposed to moisture, covers shall be waterproof.
 - 4. The manufacturer's shipping skids shall be left on the equipment to provide structural support until the equipment is set in the final resting place.
 - 5. Refer to Section 26 05 00 for additional requirements. Contractor shall furnish new equipment to replace any equipment that is exposed to weather or subjected to other deleterious effects of construction.

- B. Approved Conditions for Equipment Storage:
 - 1. General: Where storage conditions specified above are not available, indoor or outdoor storage shall comply with the following.
 - 2. Switchboards, Motor Control and Other General Distribution and Utilization Equipment:
 - a. Store metal-enclosed equipment in an upright position. Provide good ventilation of the shelter and protection from dirt, moisture and physical damage.
 - b. Space heaters furnished with the equipment shall be connected to a continuous source of power of the proper rating. Where space heaters are supplied from auxiliary power transformers, care shall be taken that low-voltage heater circuits are properly isolated before power source connection to prevent inadvertent energizing of the auxiliary transformer and associated high-voltage primary wiring.
 - c. Ambient conditions may allow condensation inside waterproof covers. If condensation is occurring, temporary heaters or lamp banks shall be provided of sufficient wattage to prevent condensation.
 - d. Contractor shall ensure that equipment stored in shipping cases receives adequate ventilation to avoid mildew and prevent condensation.
- C. Transformer
 - 1. Indoor storage shall be provided for all transformers.

3.3 GROUND FAULT PROTECTION OF EQUIPMENT

- A. General: Provide for system performance testing as required by the California Electrical Code. Provide each ground fault relay, sensing device or ground fault protection system with instructions and a test form. The form shall be retained by those in charge of the building's electrical installation and be available to the authority having jurisdiction. The instruction content shall be as required by UL.

3.4 LABELING

- A. Nametag: Provide a nametag for each piece of distribution equipment; see Section 26 05 53, Electrical Identification.

END OF SECTION 26 20 00

SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Wiring devices.
- B. Related Sections:
 - 1. Section 26 05 00: Common Work Results for Electrical.
 - 2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.
 - 3. Section 26 05 26: Grounding and Bonding for Electrical Systems.
 - 4. Section 26 05 33: Raceway and Boxes for Electrical Systems.
- C. Reference Standards:
 - 1. California Electrical Code (CEC). California Code of Regulations, Title 24, Part 3.
 - 2. National Electrical Manufacturers Association (NEMA):
 - a. WD 1 General Color Requirements for Wiring Devices.
 - b. WD 6 Wiring Devices - Dimensional Specifications.
 - 3. National Electrical Manufacturers Association (NECA):
 - a. 1 Good Workmanship in Electrical Construction.
 - 4. National Electrical Testing Association (NETA):
 - a. ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
 - 5. Underwriters Laboratories, Inc. (UL):
 - a. 20 Safety General-Use Snap Switches.
 - b. 231 Standard for Power Outlets.
 - c. 498 Attachment Plugs and Receptacles.
 - d. 943 Ground-Fault Circuit-Interrupters.
 - e. 1436 Standard for Outlet Circuit Testers and Similar Indicating Devices.
 - f. 1472 Solid-State Dimming Controls.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Receptacles, Switches, Wall Plates:
 - 1. Cooper Wiring Devices; Division of Cooper Industries, Inc.
 - 2. Hubbell Incorporated; Wiring Device-Kellems.
 - 3. Leviton Mfg. Company, Inc.
 - 4. Pass & Seymour/ Legrand.

2.2 RECEPTACLES

- A. General for all receptacles:
 - 1. Device shall be listed by UL
 - 2. Mounting straps shall be plated steel, with break-off plaster ears and shall include a

- self-grounding feature (this feature does not substitute for a grounding conductor terminated on grounding strap of device). Terminal screws shall be brass, brass plated or a copper alloy metal.
3. Receptacles shall be of a screw terminal type, "pressure type quick wire" terminations are not allowed.
- B. Duplex receptacles shall be premium specification grade single phase, 20 ampere, 120 volts, 2-pole, 3-wire, and conform to the NEMA 5-20R configuration in NEMA WD 6. The duplex type shall have bussing break-off feature for two-circuit operation. The ungrounded pole of each receptacle shall be provided with a separate terminal:
1. Wiring device color shall be standard white. Contractor to verify device color with Architect prior to procurement.
 2. Ground Fault Interrupter Duplex Receptacles - Shall be an integral unit suitable for mounting in a standard outlet box:
 - a. Ground fault interrupter shall be commercial grade and consist of a differential current transformer, solid state sensing circuitry and a circuit interrupter switch. It shall be rated for operation on a 60 Hz, 120 volt, 20-ampere branch circuit. Device shall meet CEC requirements. Device shall have a minimum nominal tripping time of 1/30th of a second. Devices shall meet UL 943.
- C. Receptacles; 20, 30 and 50 ampere, 250 volts: Shall be complete and match with appropriate cord grip plug. Devices shall meet UL 231.
- D. Weatherproof Receptacles: Shall consist of a listed weather resistant duplex receptacle, mounted in box with a gasketed, while in use weatherproof, cast metal cover plate and cap receptacle opening. The cap shall be permanently attached to the cover plate by a spring-hinged flap.

2.3 SWITCHES

- A. Toggle switches shall be totally enclosed tumbler type with bodies of phenolic compound. Toggle handles color to match receptacle device color unless otherwise specified:
1. Shall be single unit toggle, butt contact, quiet AC type, heavy-duty general-purpose use with an integral self-grounding mounting strap with break-off plaster ears and be of a screw terminal type.
 2. Shall be color coded for current rating, listed by UL, and meet the requirements of NEMA WD 1, Heavy-Duty and UL20.
 3. Ratings:
 - a. 120 volt circuits: 20 amperes at 120-277 volts AC.
 - b. 277 volt circuits: 20 amperes at 277 volts AC.
 4. The switches shall be mounted on the strike plate side of doors.
 5. Incorporate barriers between switches with multi-gang outlet boxes where required by the CEC.
 6. All toggle switches shall be of the same manufacturer.

2.4 WALL PLATES

- A. Wall plates for switches and receptacles shall be type 302 stainless steel.
- B. Standard NEMA design, so that products of different manufacturers will be interchangeable. Dimensions for openings in wall plates shall be accordance with NEMA WD1.
- C. For receptacles or switches ganged together, wall plates shall be a single ganged plate.
- D. Wall plates for data, telephone or other communication outlets shall be as specified in the

associated specification.

- E. Surface mounted boxes, NEMA1, shall be industrial grade raised galvanized steel covers. In shop areas, all receptacles shall be dust proof and or waterproof where applicable.
- F. Waterproof device covers shall be cast iron, 4-corner screw type, for FS and FD type mounting. Device covers shall be zinc galvanized finish. Weatherproof covers shall be lockable.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the CEC, NECA "Standard of Installation", and as shown as on the drawings.
- B. Ground terminal of each receptacle shall be bonded to the outlet box with an approved green bonding jumper, and also be connected to the green equipment grounding conductor.
- C. General: Devices shall be of the type specified herein. All devices shall be installed with "pigtailed" leads from the outlet box. No device shall be used in the "feed through" application. Screw terminals shall be used to connect all devices to the circuit and shall be grounded by means of a ground wire where grounding terminals are provided in the device.
- D. Installation: Devices and plates shall be installed in a "plumb" condition and must be flush with the finish surface of the wall where boxes are recessed.
- E. Mounting heights: All control and convenience devices shall comply with California Code of Regulations Title 24, ADA, and CBC with respect to accessibility requirements. Mounting heights indicated on plans shall have precedence.
- F. Install switches with the off position down.
- G. Clean debris from outlet boxes.
- H. Provide extension rings as required to bring outlet boxes flush with finished surface or casework.
- I. Test each receptacle device for proper polarity.

END OF SECTION 26 27 26

SECTION 26 33 23 - CENTRAL BATTERY EQUIPMENT FOR EMERGENCY LIGHTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following central battery and power conversion equipment rated 600 V and less for emergency lighting:
 - 1. Interruptible (slow-transfer) central battery equipment.
 - 2. Interruptible (fast-transfer) central battery equipment.
 - 3. Uninterruptible (UPS-type) central battery equipment.

1.3 DEFINITIONS

- A. BAS: Building Automation System.
- B. Interruptible: As used in the Section Text, an off-line, passive-standby or line-interactive, inverter-only unit, with an intentional interruption of power to the load until an internal transfer switch picks up and transfers the load to the unit's inverter and internal battery source on loss of the "normal" source, and then retransfers to the "normal" source when it is restored. Transfer time can be "slow" (up to approximately 1 second) or "fast" (2-4 ms or 40-50 ms, depending on manufacturer).
- C. LED: Light-emitting diode.
- D. Low Voltage: As defined in CEC for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.
- E. NiCd: Nickel cadmium.
- F. OCPD: Overcurrent protective device.
- G. PC: Personal computer.
- H. PWM: Pulse-width modulated.
- I. TDD: Total demand (harmonic current) distortion (also listed as "THD" in catalog data by manufacturers).
- J. THD(V): Total harmonic voltage demand.
- K. Uninterruptible: As used in the Section Text, an on-line, double-conversion (rectifier/inverter) unit, with no interruption of power to the load on interruption and restoration of the "normal" source.
- L. UPS: Uninterruptible power supply.
- M. VRLA: Valve-regulated lead acid.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type and rating of central battery equipment unit.
 - 1. Include features, performance, electrical ratings, operating characteristics, shipping and operating weights, shipping splits, and furnished options, specialties, and accessories.
- B. The manufacturer shall be ISO9001 "Quality Assurance Certified" and shall upon request furnish certification documents.
- C. Shop Drawings: For each type and rating of central battery equipment unit.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, ventilation requirements, method of field assembly, components, and location and size of each field connection.
 - 3. Include system one-line diagram, internal and interconnecting wiring, and diagrams for power, signal, and control wiring.
 - 4. Include elevation, details, and legends of control and indication displays.
 - 5. Include -circuit current (withstand) rating of unit.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around central battery equipment. Show central battery equipment layout and relationships between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.
- B. Qualification Data: For testing agency.
- C. Seismic Qualification Certificates: For central battery equipment, accessories, and components, from manufacturer.
 - 1. Certificate of compliance.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Product Certificates: For each type of central battery equipment.
- E. Harmonic Analysis Study and Report: Comply with IEEE 399 and NETA Acceptance Testing Specification; identify the effects of nonlinear loads and their associated harmonic contributions on the voltages and currents throughout the electrical system. Analyze **designated** operating scenarios, including recommendations for input filtering of central battery equipment to limit TDD and THD(V) to specified levels.
- F. Source quality-control reports.
- H. Field quality-control reports.
- I. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For central battery equipment to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
 - a. Manufacturer's written instructions for testing central battery equipment.
 - b. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
 - c. Manufacturer's written instructions for selecting and setting field-adjustable controls and status and alarm points.

1.7 QUALITY ASSURANCE

- A. The manufacturer shall have a minimum of 20 years of experience in design, manufacture, and testing of solid-state UPS Systems
- B. The Manufacturer shall be ISO 9001 Certified.
- C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by the manufacturer.
- B. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment in fully enclosed vehicles.
- B. Store equipment in spaces having environments controlled within manufacturers' written instructions for ambient temperature and humidity conditions for non-operating equipment.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - 1. Ambient Temperature: Less than 0 deg F (minus 18 deg C) or exceeding 104 deg F (40 deg C), with an average value exceeding 95 deg F (35 deg C) over a 24-hour period.
 - 2. Ambient Storage Temperature: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C).
 - 3. Humidity: More than 95 percent (condensing).
 - 4. Altitude: Exceeding 3300 feet (1000 m).
- B. Interruption of Existing Electrical Distribution Systems: Do not interrupt electrical distribution systems within facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify **Owner** no fewer than five days in advance of proposed interruption of electrical systems.
 - 2. Indicate method of providing temporary electrical service.
 - 3. Do not proceed with interruption of electrical systems without **Owner's** written permission.
 - 4. Comply with NFPA 70E.
- C. Dimensions of larger central battery equipment, especially units with multiple battery

enclosures and other devices, or various options, can vary in size between manufacturers. Retain "Product Selection for Restricted Space" Paragraph below if installation space for battery equipment is limited; indicate maximum dimensions on Drawings.

- D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for central battery equipment, including clearances between central battery equipment and adjacent surfaces and other items.

1.10 COORDINATION

- A. Coordinate sizes and locations of concrete bases. Cast anchor-bolt inserts into bases.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace central battery equipment that fails in materials or workmanship within specified warranty period. Special warranty, applying to batteries only, applies to materials only, on a prorated basis, for period specified.
 - 1. Warranty Period: Include the following warranty periods, from date of Substantial Completion:
 - a. Central Battery Equipment (excluding Batteries): **One** year. The Manufacturer shall warrant the central lighting inverter module against defects in materials and workmanship for 12 months after initial start-up or 18 months after ship, date, whichever period expires first.
 - b. Standard VRLA Batteries:
 - 1) Full Warranty: **One** year.
 - 2) Pro Rata: **Nine** years.
 - c. Premium VRLA Batteries:
 - 1) Full Warranty: **One** year.
 - 2) Pro Rata: **19** years.
 - d. NiCd, Wet-Cell Batteries:
 - 1) Full Warranty: **Five** years.
 - 2) Pro Rata: **15** years.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. UL Compliance: Listed and labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, in accordance with UL 1778 & UL924
- B. Seismic Performance: Central battery equipment shall withstand the effects of earthquake motions determined according to ASCE/ SEI 7. The designated central battery equipment shall be tested and certified by an NRTL as meeting ICC-ES AC 156 test procedure requirements.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified **and the unit will be fully operational after the seismic event.**"

2.2 INTERRUPTIBLE (SLOW-TRANSFER) CENTRAL BATTERY EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **product**

indicated on Drawings or comparable product by one of the following:

1. Chloride Systems.
2. Controlled Power Company.
3. Cooper Industries, Inc.
4. Crucial Power Products.
5. Dual-Lite.
6. Emergi-Lite; Thomas & Betts Corporation.
7. Lightalarms; Thomas & Betts Corporation.
8. LightGuard, A Philips Group Brand.
9. Lithonia Lighting; Acuity Brands Lighting, Inc.
10. Myers Power Products, Inc.
11. Online Power, Inc.

C. General Requirements for Interruptible (Slow-Transfer) Central Battery Equipment:

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
2. NRTL Compliance: Fabricate and label central battery equipment to comply with UL 924.
3. Comply with CEC, and CBC.
4. Source Limitations: Obtain central battery equipment, including batteries, overcurrent protective devices, components, and accessories, from single source from single manufacturer.

D. Performance Requirements:

1. Slow-Transfer Central Battery Equipment: Passive-standby (off-line) system. Automatically sense loss of normal alternating-current (ac) supply and use an electromechanical transfer switch to transfer loads. Transfer in one second or less from normal supply to battery-inverter supply.
2. Automatic Operation:
 - a. Normal Conditions: Supply the load with ac power flowing from normal ac power input terminals, bypassing inverter, with battery connected in parallel via rectifier/charger output.
 - b. Abnormal Supply Conditions: If normal ac supply deviates from specified voltage, transfer switch operates and battery supplies constant, regulated ac power through the inverter to the load, with a momentary loss of power to the load.
 - c. If normal power fails, transfer switch operates and battery supplies constant, regulated ac power through the inverter to the load, with a momentary loss of power to the load.
 - d. If a fault occurs in a system when being supplied by inverter and current flows in excess of the overload rating of inverter, inverter automatically protects itself against damage from overloads and short circuits by shutting down.
 - e. When normal ac power is restored at input supply terminals of unit, controls automatically retransfer the load back to the normal ac supply, with a momentary loss of power to the load. Rectifier/ charger then recharges battery.
 - f. If normal power failure is prolonged (more than 90 minutes), integral low-voltage battery protective circuit disconnects battery and prevents battery from damage due to deep discharge.
 - g. If battery becomes discharged, and when normal ac supply is again available, rectifier/ charger recharges battery. When the battery is fully charged, rectifier/ charger automatically shifts to float-charge mode.
 - h. If the battery is disconnected, and normal ac power is available, central battery equipment continues to supply power to the load with no degradation of its regulation of voltage and frequency of output bus.

E. Unit Operating Requirements:

1. Input AC Voltage Tolerance: Plus 10 and minus **15** percent of central battery equipment input voltage rating.
 2. Input Frequency Tolerance: Plus or minus **5** percent of central battery equipment frequency rating.
 3. Synchronizing Slew Rate: **1** Hz per second, maximum.
 4. Minimum Off-Line Efficiency: **99** percent at 60 Hz, full load.
 5. Minimum Displacement Primary-Side Power Factor: **98** percent under any load or operating condition.
 6. Ambient Temperature Rating (Other Than Batteries): Not less than 68 deg F (20 deg C) and not exceeding 86 deg F (30 deg C).
 7. Ambient Storage Temperature Rating (Other Than Batteries): Not less than minus 4 deg F (minus 20 deg C) and not exceeding 158 deg F (70 deg C.)
 8. Ambient Temperature Rating (Batteries): Not less than 32 deg F (0 deg C) and not exceeding 104 deg F (40 deg C).
 9. Ambient Storage Temperature Rating (Batteries): Not less than 0 deg F (minus 18 deg C) and not exceeding 104 deg F (40 deg C.)
 10. Humidity Rating: Less than 95 percent (noncondensing).
 11. Altitude Rating: Not exceeding 3300 feet (1005 m).
 12. Off-Line Overload Capability: **1.1** times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
- F. Inverter and Controls Logic: Microprocessor based, isolated from all power circuits; provides complete self-diagnostics, periodic automatic testing and reporting; with alarms.
- G. Controls and Indication:
1. Status Indication: Door-mounted, labeled LED indicators or digital screen displaying the following conditions:
 - a. Normal power available.
 - b. Status of system.
 - c. Battery charging status.
 - d. On battery power.
 - e. System fault.
 - f. External fault.
 2. Remote Signal Interfaces:
 - a. Remote Indication Interface: A minimum of **one** programmable (Form C) dry-circuit relay output(s) (120-V ac, 2 A) for remote indication of the following:
 - 1) Fault or status indication.
 - 2) On bypass.
 - 3) Low battery.
 - 4) UPS On
 - 5) Input Fail
 - 6) Summary Alarm
 - b. Communications Interface: Factory-installed hardware and software to enable a remote PC to program central battery equipment and monitor and display status and alarms.
 - 1) Compliance with ASHRAE 135: Controllers shall support serial MS/ TP and Ethernet IP communications and shall be able to communicate directly via BAS RS-485 serial networks and Ethernet 10Base-T networks as a native device.
- H. Self-Protection and Reliability Features:
1. Input transient protection by means of surge suppressors to provide protection against damage from supply voltage surges as defined in IEEE C62.45, Category B and C.
 2. Integral, programmable, self-diagnostic and self-test circuitry; with alarms and logging.
 3. Battery deep-discharge and self-discharge protection; with alarms.

4. Battery self-test circuitry; with alarms and logging.
 5. To support compliance with IFC 1206, the system shall include protection against over-temperature conditions in the battery compartment. This protection shall function by automatically shutting off the charger when excessive temperature is detected and resuming charging once the temperature returns to the normal operating range—**without shutting down the backup battery bank.**
 6. Optional wireless battery monitoring system capable of monitoring individual batteries, battery strings, or both. The system shall feature a local display (without requiring a PC), as well as remote or web-enabled display capabilities. It shall provide real-time assessment and warnings of actual remaining battery capacity, block deterioration, and total runtime availability to maximize battery life and prevent backup failure.
- I. Integral Input Disconnecting Means and OCPD: Thermal-magnetic circuit breaker, complying with UL 489.
1. Integrated Equipment Minimum Short-Circuit Current (Withstand) Rating: **22 kA.**
 2. Optional 65kIAC Total system upgrade
- J. Inverter:
1. Description: Solid-state, high-frequency, PWM type, with the following operational features:
 - a. Automatically regulate output voltage to within plus or minus **3** percent, for all load ranges and for maximum 25 percent step-load changes; regulation may increase to **8** percent for 100 percent step-load changes.
 - b. Automatically regulate output frequency to within plus or minus **1** Hz, from no load to full load, at unity power factor, over the operating range of battery voltage.
 - c. Output Voltage Waveform: Sine wave with maximum **3** percent TDD throughout battery operating-voltage range, for 100 percent linear load.
 - d. Load Power Factor: **0.5** lead to **0.5** lag.
 - e. Inverter Overload Capability: **115** percent for 10 minutes; 150 percent surge for **10** seconds.
- K. Rectifier/ Battery Charger:
1. Description: Solid state, variable rate, temperature compensated; automatically maintains batteries in fully charged condition when normal power is available.
 2. Maximum Battery Recharge Time from Fully Discharged State: **12** hours.
 3. Low-voltage disconnect circuit reduces battery discharge during extended power outages, monitors battery voltage, and disconnects inverter when battery voltage drops to no less than 85.7 percent of nominal voltage.
- L. Batteries:
1. Description: **Standard VRLA** batteries.
 - a. Capable of sustaining full-capacity output of inverter unit for minimum of **90 minutes.**
 2. Battery Disconnect and OCPD: Manufacturer's standard.
- M. Maintenance Bypass Systems:
1. Maintenance Bypass Mode: Internal; manual operation only; bypasses central battery equipment power circuits (inverter and transfer switch); requires local operator selection at central battery equipment. Transfer and retransfer shall be **break-before-make, with temporary disrupting power to the load.**
 2. Bypass Overload Capability: **1.5** times the base load current.
- N. Integral Output Disconnecting Means and OCPD:
1. Multiple-Output OCPDs: Thermal-magnetic circuit breakers, complying with UL 489; voltage rating matching unit output voltage rating; 20 A, single pole.

2.3 UNINTERRUPTIBLE (UPS-TYPE) CENTRAL BATTERY EQUIPMENT

- A. Double conversion, Standard Efficiency: The UPS module shall be designed to operate as an on-line, high precision PWM conversion, fully automatic system with “no break” transfer time. The UPS shall incorporate high-frequency pulse width modulation (PWM) and digital signal processing (DSP) for precise control and monitoring. Key protection features include:
- B. **Automatic Overload & Short Circuit Protection:** Capable of handling 150% momentary surge capacity, with the ability to withstand:
 - 1. 115% overload for 5 to 10 minutes.
 - 2. 125% overload for 30 seconds.
- C. **Low Battery Voltage Disconnect:** To prevent damage to the battery bank.
- D. **Output Quality:** The UPS shall deliver a clean, computer-grade sinusoidal output waveform with:
 - 1. Less than 5% Total Harmonic Distortion (THD) at full-rated load.
- E. **Dynamic Brownout Protection:** Maintains voltage regulation without continuously switching to batteries for low voltage situations (up to -15%).
- F. **Output Regulation:** The system shall maintain output regulation within $\pm 5\%$ under all operating conditions, excluding overload and short circuit events.
- G. **Over-temperature Protection:** The UPS shall have an internal over-temperature protection mechanism, with an alarm in the event of a fault.

AC Input Specifications

- H. **Frequency:** 60 Hz \pm 5%
- I. **Input Current:** Sinusoidal, with near-unity power factor under all line and load conditions (includes power factor correction).
- J. **Input Protection:** Optional input circuit breaker.
- K. **Input Surge Protection:** Transient Voltage Surge Suppressor (TVSS).
- L. **Transfer Time:** Zero-break transfer; (unit static transfer must not switch upon input power loss).
- M. **Slew Rate:** Maximum of 0.2 Hz/second.
- N. **Input Power Connections:** Hardwired terminal block accepting wire ranges from 14 AWG to 2/0 AWG; two wires plus ground.

AC Output Specifications

- O. **Frequency:** 60 Hz \pm 0.5 Hz.
- P. **Voltage Regulation:** 3% (Typical).
- Q. **Output Waveform:** Sinusoidal.

- R. **Voltage Distortion:**
 - 1. Less than 5% Total Harmonic Distortion (THD).
 - 2. Less than 3% single harmonic distortion.
- S. **Overload Capability:**
 - 1. **Inverter Overload:** 115% for 5 to 10 minutes, 125% for 30 seconds.
 - 2. Bypass Overload: 150%.
- T. **Protection:** Fault current limited.
- U. **Non-Linear Load Capability:** 100% load.
- V. **Crest Factor:** 3:1.
- W. **Output Power Connections:** Hardwired terminals accepting wire ranges from 14 AWG to 2/0 AWG:
 - 1. Two wires plus ground for single-voltage output.
 - 2. Three wires plus ground for dual-voltage output.

2.4 ENCLOSURES

- A. Central Battery Equipment Enclosures: NEMA 250, to comply with environmental conditions at installed location.
 - 1. Dry and Clean Indoor Locations: **Type 1** steel cabinets with access to components through hinged doors with flush tumbler lock and latch.
 - 2. Finish: Manufacturer's **standard baked-enamel finish over corrosion-resistant prime treatment**.
 - 3. NEMA 3R: Damp or wet locations/Outdoors

2.5 SOURCE QUALITY CONTROL

- A. Testing Agency: **Engage** a qualified testing agency to evaluate central battery equipment fabricator's quality-control and testing methods.
- B. Testing: Test and inspect central battery equipment according to UL 924.
- C. Factory Tests: Test and inspect assembled central battery equipment according to UL 924. Affix standards organization's label. Include the following:
 - 1. Functional test and demonstration of all functions, controls, indicators, sensors, and protective devices.
 - 2. Full-load test.
 - 3. Transient-load response test.
 - 4. Overload test.
 - 5. Power failure test.
- D. Central battery equipment will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store central battery equipment according to NECA 411.
- B. Examine areas, surfaces, and substrates to receive central battery equipment, with Installer present, for compliance with requirements for installation tolerances, structural support, ventilation, temperature, humidity, and other conditions affecting performance of the Work.
 - 1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment will be installed before installation begins.
- C. Examine equipment before installation. Reject equipment that is wet, moisture damaged, or mold damaged.
- D. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 HARMONIC ANALYSIS STUDY

- A. Perform a harmonic analysis study to identify the effects of nonlinear loads and their associated harmonic contributions on the voltages and currents throughout the electrical system. Analyze **designated** operating scenarios, including recommendations for central battery equipment input filtering to limit TDD and THD(V) to specified levels.
- B. Prepare a harmonic analysis study and report complying with IEEE 399 and with NETA Acceptance Testing Specification.

3.3 INSTALLATION

- A. Coordinate layout and installation of central battery equipment with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- C. Install central battery equipment and accessories according to NECA 411.
- D. Wall-Mounted Central Battery Equipment: Install central battery equipment on walls with tops at uniform height and with disconnect operating handles not higher than 79 inches (2000 mm) above finished floor unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For units not on walls, provide freestanding racks complying with Section 26 05 29 "Hangers and Supports for Electrical Systems."
- F. Suspended-Mounted Central Battery Equipment: Suspend central battery equipment from structural ceiling components using hangers, clamps, and associated fittings, designed for types and sizes of units to be supported. Provide support devices complying with Section 260529 "Hangers and Supports for Electrical Systems."
- H. Floor-Mounted Central Battery Equipment: Install central battery equipment on 4-inch (100-mm) nominal-thickness concrete base. Comply with requirements for concrete base.
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- I. Seismic Bracing: Comply with requirements specified in Section 26 05 48 "Vibration and Seismic Controls for Electrical Systems."
 - J. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
 - K. Comply with NECA 1.
 - L. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 2. Comply with requirements for cable trays specified in Section 26 05 36 "Cable Trays for Electrical Systems."
 3. Comply with requirements for raceways and boxes specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."
 - M. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
 - N. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.4 CONNECTIONS

- A. Connections: Interconnect system components. Make connections to supply and load circuits according to manufacturer's wiring diagrams unless otherwise indicated.
- B. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."
 1. Separately Derived Systems: Make grounding connections to grounding electrodes and bonding connections to metallic piping systems as indicated; comply with CEC.
- C. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.5 CONTROL WIRING INSTALLATION

- A. Install wiring between central battery equipment and remote devices. Comply with requirements in Section 26 05 23 "Control-Voltage Electrical Power Cables."
- B. Bundle, train, and support wiring in enclosures.

3.6 IDENTIFICATION

- A. Identify central battery equipment, components, and control wiring. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
 1. Identify field-installed conductors, interconnecting wiring, and components; provide

- warning signs.
 - 2. Label central battery equipment with engraved nameplates.
 - 3. Label each separate cabinet, for multi-cabinet units.
 - 4. Label each enclosure-mounted control and pilot device.
 - B. Operating Instructions: Frame printed operating instructions for central battery equipment, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of central battery equipment units.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: **Engage** a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
- D. Acceptance Testing Preparation:
 - 1. Inspect and Test Each Component:
 - a. Inspect wiring, components, connections, and equipment installations. Test and adjust components and equipment.
 - b. Test insulation resistance for all external branch circuit, feeder, control, and alarm wiring connected to central battery equipment element and component.
 - c. Test continuity of each circuit.
- E. Tests and Inspections:
 - 1. Inspect central battery equipment, wiring, components, connections, and equipment installation.
 - 2. Test insulation resistance for all external branch circuit, feeder, control, and alarm wiring connected to central battery equipment element and component.
 - 3. Test continuity of each circuit.
 - 4. Verify that input voltages and frequencies at central battery equipment locations are within voltage and frequency limits specified in Part 2. If outside this range, notify **Owner** before closing input OCPDs.
 - 5. Perform each visual and mechanical inspection and electrical test stated in manufacturer's written instructions and in NETA Acceptance Testing Specification, including specifically those for batteries, battery chargers, and UPS, regardless of the type of central battery equipment provided. Certify compliance with test parameters.
 - 6. Perform a load-duration test at rated voltage and rated output current to verify the correct functional operation of the unit under full-load stable operating conditions for the minimum time limits required by UL 924. Monitor and record ambient temperature and temperatures within the unit.
 - 7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of central battery equipment. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of central battery equipment 11 months after date of Substantial Completion.
 - c. Instruments and Equipment: Use an infrared scanning device designed to

measure temperature or to detect significant deviations from normal values.
Provide calibration record for device.

9. Test and adjust controls, remote monitoring, and safety. Replace damaged and malfunctioning controls and equipment.

- F. Central battery equipment will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports, including a certified report that identifies central battery equipment and describes all test results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.8 STARTUP SERVICE

- A. **Perform** startup service.
 1. Complete installation and startup checks according to manufacturer's written instructions.

3.9 ADJUSTING

- A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.
- B. Set field-adjustable switches, auxiliary relays, and other adjustable parts.
- C. Adjust the trip settings of thermal-magnetic circuit breakers with adjustable, instantaneous-trip elements; install fuses if not factory installed.
- D. Set the automatic system test parameters.

3.10 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until controllers are ready to be energized and placed into service.
- B. Replace central battery equipment whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.11 DEMONSTRATION

- A. **Train** Owner's maintenance personnel to adjust, operate, and maintain central battery equipment, and to use and reprogram microprocessor-based control, monitoring, and display functions.
 1. Provide Owner with minimum 4-hour training session, presented by factory technician, on use and maintenance of battery power system

END OF SECTION 26 33 23

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Interior lighting systems, including luminaires, LED's, and emergency lighting equipment.
- B. Related Sections:
 - 1. Section 26 05 00: Common Work Results for Electrical.
 - 2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.
 - 3. Section 26 05 26: Grounding and Bonding for Electrical Systems.
 - 4. Section 26 05 33: Raceway and Boxes for Electrical Systems.
- C. Reference Standards:
 - 1. California Electrical Code (CEC) based on NFPA 70 (NEC). California Code of Regulations, Title 24, Part 3.
 - 2. California Energy Code. California Code of Regulations, Title 24, Part 6.
 - 3. National Electrical Manufacturers Association (NEMA).
 - a. 50 Enclosures for Electrical Equipment.
 - b. 67 Panelboards.
 - c. 489 Molded Case Circuit Breakers and Circuit Breaker enclosures.
 - 4. Underwriters Laboratories, Inc. (UL).
 - a. 50 Enclosures for Electrical Equipment.
 - b. 67 Panelboards.
 - c. 489 Molded Case Circuit Breakers and Circuit Breaker enclosures.
 - 5. Aluminum Association Inc. (AA).
 - 6. Illuminating Engineering Society of North America (IESNA or IES).

1.3 SUBMITTALS

- A. Submit in accordance with Section 26 05 00: Common Work Results for Electrical.
- B. Shop Drawings:
 - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - 2. Include electrical ratings, dimensions, mounting, details, materials, terminations, wiring and connection diagrams, photometric data, ballasts, luminaires, lamps, and controls.

1.4 DEFINITIONS

- A. Lighting terminology used herein is defined in IES.
- B. Exception: The term "driver" is used herein to cover both drivers and power supplies, where applicable.

- C. Clarification: The term “LED light source(s)” is used herein per IES to cover LED package(s), module(s), and array(s).

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be in accordance with CEC, UL, ANSI, and as shown on the drawings and specified.

2.2 LIGHTING FIXTURES (LUMINAIRES)

- A. Shall be in accordance with CEC, UL 1598 and shall be as shown on drawings and as specified. All luminaires shall have been certified to the California Energy Commission by its manufacturer to comply with the efficiency standards as per California Code of Regulations Title 24, Part 6, Section 111 referencing the Appliance Efficiency Regulations in Title 20. Post certification with building permit.
- B. Sheet Metal:
 - 1. Shall be formed to prevent warping and sagging. Housing, trim, and lens frame shall be true, straight (unless intentionally curved) and parallel to each other as designed.
 - 2. Wireways and fittings shall be free of burrs and sharp edges and shall accommodate internal and branch circuit wiring without damage to the wiring.
 - 3. When installed, any exposed fixture housing surface, trim frame, door frame and lens frame shall be free of light leaks; lens doors shall close in a light tight manner:
 - a. Hinged door closure frames shall operate smoothly without binding when the fixture is in the installed position, and latches shall function easily by finger action without the use of tools.
- C. Recessed fixtures shall be of the type approved for the ceiling and insulation conditions and appropriate for the installation location. Insulation must be held back from the fixture to provide manufacturers' recommended clearances for proper operation. Thermal tripping shall be the installer's responsibility to correct. Where installed in fire rated ceilings, coordinate installation of fire rated enclosures around the ceiling penetrations. Fixtures shall contain the proper through wiring capacity for that which is shown on the plans.
- D. Recessed fixtures shall be provided with the appropriate trims and hardware compatible with the ceiling type shown. Plaster frames are required where plaster or gypsum board ceilings are encountered.
- E. Fixtures with louvers or light transmitting panels shall have hinges, latches, and safety catches to facilitate safe, convenient cleaning and relamping.
- F. Mechanical Safety: Lighting fixture closures (lens doors, trim frame, hinged housings, etc.) shall be retained in a secure manner by captive screws, chains, captive hinges, or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.
- G. Metal Finishes:
 - 1. The manufacturer shall apply standard finish (unless otherwise specified) over a corrosion resistant primer, after cleaning to free the metal surfaces of rust, grease, dirt, and other deposits. Edges of pre-finished sheet metal exposed during forming, stamping, or shearing processes shall be finished in a similar corrosion resistant manner to match the adjacent surface(s). Fixture finish shall be free of stains or

- evidence of rusting, blistering, or flaking.
 - 2. Interior light reflecting finishes shall be white with not less than 85 percent reflectance's, except where otherwise specified on the drawing.
 - 3. Exterior finishes shall be as shown on the drawings.
- H. Provide all lighting fixtures with a specific means for grounding metallic wireways and housings to an equipment grounding conductor.
- I. Light Transmitting Components for Fixtures:
 - 1. Shall be 100 percent virgin acrylic plastic or water white, annealed, crystal glass.
 - 2. Flat lens panels shall have not less than 1/8 inch of average thickness. The average thickness shall be determined by adding the maximum thickness to the minimum unpenetrated thickness and dividing the sum by 2.
 - 3. Unless otherwise specified, lenses, diffusers and louvers shall be retained firmly in a metal frame by clips or clamping ring in such a manner as to allow expansion and contraction of the lens without distortion or cracking.
- J. Recessed compact LED fixtures shall be manufactured specifically for LED lamps with drivers integral to the fixture. Assemblies designed to retrofit fixtures are prohibited except when described in this fashion.

2.3 LED LUMINAIRE REQUIREMENTS

- A. General Requirements:
 - 1. Luminaire shall have an external label per ANSI C136.15.
 - 2. Luminaire shall have an internal label per ANSI C136.22.
 - 3. Luminaires shall start and operate in -20°C to +40°C ambient.
 - 4. LED light source(s) and driver(s) shall be RoHS compliant.

2.4 EMERGENCY FIXTURE POWER SUPPLY

- A. Self-contained battery-operated power supply for operating specified fixture for a minimum output of 90 minutes.
- B. The power supply shall be installed within the luminaire ballast compartment or wireway. Provide with test switch and charge indicator installed integral to the luminaire. The test switch and charge indicator may be installed in a remote ceiling mounted flush J-box for recessed downlights which cannot accept integral components.
- C. Performance: Emergency operation lumen output for specified fixtures shall be a minimum of 600 lumens.

2.5 LED DRIVER

- A. Driver:
 - 1. Rated case temperature shall be suitable for operation in the luminaire operating in the ambient temperatures as indicated.
 - 2. Shall accept the voltage or voltage range indicated and shall operate normally for input voltage fluctuations of plus or minus 10 percent. Consistent with NEMA SSL 1.
 - 3. Shall have a minimum Power Factor (PF) of 0.90 at full input power and across specified voltage range.
- B. Electromagnetic interference:
 - 1. Shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and

- across specified voltage range.
- 2. Shall comply with FCC 47 CFR part 15 non-consumer RFI/ EMI standards.
- C. The following shall be in accordance with corresponding sections of ANSI C136.37:
 - 1. Wiring and grounding.
 - 2. All internal components shall be assembled and pre-wired using modular electrical connections.
 - 3. Mounting provisions.
 - 4. Terminal blocks for incoming AC lines.
 - 5. Latching and hinging.
 - 6. Ingress protection.

2.6 LAMPS

- A. Led Light Source:
 - 1. Minimum Color Rendering Index (CRI): 60.
 - 2. Correlated Color Temperature (CCT):
 - a. CCT shall be as listed in Table 1 below:

Table 1. Allowable CCT

Manufacturer-Rated Nominal CCT (K)	Allowable LM-79 Chromaticity Values <u>Measured CCT (K)</u>
2700	2580 to 2870
3000	2870 to 3220
3500	3220 to 3710
4000	3710 to 4260
4500	4260 to 4746
5000	4745 to 5311
5700	5310 to 6020
6500	6020 to 7040

PART 3 EXECUTION

3.1 INSTALLATION

- A. Installation and furnishing of lighting fixtures shall be in accordance with the CEC, manufacturer's instructions and as shown on the drawings or specified. Fixtures damaged in transit and storage prior to completion shall be replaced at Contractor's expense.
- B. Align, mount and level the lighting fixtures uniformly.
- C. Avoid interference with and provide clearance for equipment. Where the indicated locations for the lighting fixtures conflict with the locations for equipment, change the locations for the lighting fixtures by the minimum distances necessary as approved by the Architect. The Architectural reflected ceiling plan will take precedence over electrical plans.

- D. For suspended lighting fixtures, the mounting heights shall provide the clearances between the bottoms of the fixtures and the finished floors as shown on the drawings.
- E. Lighting Fixture Supports:
1. Contractor shall provide support for all of the fixtures independent of suspended ceilings. Supports may be anchored to channels of the ceiling construction, to the structural slab or to structural members within a partition, or above a suspended ceiling.
 2. Shall maintain the fixture positions after cleaning and re-lamping.
 3. Shall support the lighting fixtures without causing the ceiling or partition to deflect.
 4. Hardware for recessed fluorescent fixtures:
 5. Fixtures shall be supported as detailed on drawings and as required by DSA standards.
 6. Installation: Fixtures shall be securely mounted on ceilings and walls with appropriate fastening devices. "Drop-in" type T-bar fixtures shall be secured with #12 gauge safety "earthquake wires" as described by California Code of Regulations Title 24 Part 2, Chapter 47. "Tek Screws" will be required for fastening to the T-bar system in addition to safety wire. Surface mounted fluorescent fixtures shall be solidly screwed or clipped into framing above drywall with 4-#10 sheet metal screws into each fixture. Provide blocking for screw supports behind all surface mounted lighting fixtures weighing more than 15 lbs.
 7. Surface mounted lighting fixtures:
 - a. Fixtures shall be bolted against the ceiling independent of the outlet box at four points spaced near the corners of each unit. The bolts shall be minimum 1/4-20 bolt, secured to structural ceiling. Non-turning studs may be attached to the building structure by 12 gauge safety hangers.
 8. Fixtures mounted in open construction shall be secured directly to the building structure with approved bolting and clamping devices.
 9. Single or double pendent mounted lighting fixtures:
 - a. Each stem shall be supported by an approved outlet box, mounted swivel joint and canopy which holds the stem captive and provides spring load (or approved equivalent) dampening of fixture oscillations. Outlet box shall be supported vertically from the building structure and be allowed to swing to a 45 degree angle.
 10. Outlet boxes for support of lighting fixtures (where permitted) shall be secured directly to the building structure with approved devices or supported vertically in a hung ceiling from the building structure with a nine gauge wire hanger and be secured by an approved device to a main ceiling runner or cross runner to prevent any horizontal movement relative to the ceiling.
- F. Coordinate between the electrical and ceiling trades to ascertain that approved lighting fixtures are furnished in the proper sizes and installed with the proper devices (hangers, clips, trim frames, flanges), to match the ceiling system being installed.
- G. Bond lighting fixtures and metal accessories to the grounding system as specified in Section 26 05 26: Grounding and Bonding for Electrical Systems.
- H. Provide unswitched leg of interior lighting branch circuit to integral emergency battery pack light fixtures, exit signs and night lights as applicable per lighting plans.
- I. Wallmount fixtures in walkway areas shall not project more than 4 inches from wall when projection occurs lower than 80 inches.

END OF SECTION 26 51 00

SECTION 26 56 00 EXTERIOR LIGHTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section specifies the furnishing, installation, and connection of exterior luminaires, controls, poles and supports.
- B. Related Sections:
 - 1. Section 26 05 00: Common Work Results for Electrical.
 - 2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.
 - 3. Section 26 05 26: Grounding and Bonding for Electrical Systems.
 - 4. Section 26 05 33: Raceway and Boxes for Electrical Systems.
 - 5. Section 26 51 00: Interior Lighting.
- C. Reference Standards:
 - 1. American Society for Testing and Materials (ASTM).
 - 2. American Concrete Institute (ACI).
 - 3. American National Standards Institute (ANSI).
 - 4. Aluminum Association Inc. (AA).
 - 5. Illuminating Engineering Society of North America (IESNA).
 - 6. National Electrical Manufacturers Association (NEMA).
 - 7. National Fire Protection Association (NFPA).
 - 8. Underwriters Laboratories, Inc. (UL).

1.3 SUBMITTALS

- A. Submit in accordance with Section 26 05 00: Common Work Results for Electrical.
- B. Shop Drawings:
 - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - 2. Include electrical ratings, dimensions, mounting, details, materials, required clearances, terminations, wiring and connection diagrams, photometric data, ballasts, poles, luminaires, effective projected area (EPA), lamps and controls.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be in accordance with CEC, UL, ANSI, as shown on the drawings and as specified.

2.2 LUMINAIRES

- A. UL 1598 and ANSI C136.17. Luminaries shall be weatherproof, heavy duty, outdoor types

designed for efficient light utilization, adequate dissipation of lamp and ballast heat and safe cleaning and relamping.

- B. Light emitting diode (LED)-based solid state lighting (SSL) products shall be factory tested in accordance to the International Engineering Society (IES) LM-79 recommendations and meet ANSI C78.377-2008 standards.
- C. LED light sources shall be factory tested in accordance to IES LM-80 recommendations.
- D. LED-based SSL product shall incorporate an external heat sink, integral to the luminaire.
- E. IESNA HB-9 and RP-8 light distribution pattern types shall be as indicated on the drawings.
- F. Lenses shall be frame-mounted heat-resistant, borosilicate glass, prismatic refractors. Attach the frame to the luminaire housing by hinges or chain.
- G. Pre-wire internal components to terminal strips at the factory.
- H. Bracket mounted luminaires shall have leveling provisions and clamp type adjustable slip-fitters with locking screws.
- I. Materials shall be rustproof. Latches and fittings shall be non-ferrous metal.
- J. LED-based SSL luminaires shall be manufactured specifically for LED lamps with drivers integral to the luminaire housing.

2.3 LED-BASED SOLID STATE DRIVERS

- A. Shall be listed by either U.L. or equal listing agency and comply with IEEE C.62.41-1991, Class A operation.
- B. Provide a minimum power factor of 0.9.
- C. Minimum operating temperature appropriate for outdoor environments.
- D. Shall operate at a frequency greater than or equal to 120Hz.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install lighting in accordance with the CEC, as shown on the drawings, and in accordance with manufacturer's recommendations.

3.2 GROUNDING

- A. Ground noncurrent-carrying parts of equipment including metal poles, luminaires, mounting arms, brackets, and metallic enclosures as specified in Section 26 05 26: Grounding and Bonding for Electrical Systems. Where copper grounding conductor is connected to a metal other than copper, provide specially treated or alloyed connectors suitable and listed for this purpose.

END OF SECTION 26 56 00

SECTION 27 10 00
STRUCTURED CABLING - NEW

1. GENERAL

1.1. SUMMARY

- 1.1.1. This section describes the structured cable system which shall include: permanently installed backbone and horizontal pathway cabling outlet assemblies, and hardware for terminating and interconnecting.
- 1.1.2. Products Installed Under this Section: Only new equipment and material, produced by manufacturers that are recognized nationally by the technology industry and approved by Underwriters Laboratory shall be used as specified in this Section or on the Drawings.
 - 1.1.2.1. All mounting hardware
 - 1.1.2.2. All mounting brackets
 - 1.1.2.3. All power cords
 - 1.1.2.4. All fiber and copper patch cords

1.2. RELATED SECTIONS

- 1.2.1. Division 01: General Requirements
- 1.2.2. Section 26 05 00: Common Work Results for Electrical
- 1.2.3. Section 27 51 26: Assistive Listening System
- 1.2.4. Section 28 16 00: Intrusion Detection System
- 1.2.5. Section 28 23 00: Digital Surveillance System

1.3. REFERENCES

- 1.3.1. NEMA – National Electrical Manufacturer’s Association
- 1.3.2. ANSI – American National Standards Institute
- 1.3.3. NEC – National Electric Code
- 1.3.4. RSEF – Relevant State Electrical and Fire Codes
- 1.3.5. IEEE – Institute of Electrical and Electronic Engineers
- 1.3.6. UL – Underwriters Laboratories, Inc.
- 1.3.7. TIA – Telecommunications industry Association Standards
- 1.3.8. ANSI/TIA – 568-C.0, Generic Telecommunications Cabling for Customer Premises
- 1.3.9. ANSI/TIA – 568-C.1, Commercial Building Telecommunications Cabling Standard
- 1.3.10. ANSI/TIA – 568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard
- 1.3.11. ANSI/TIA – 568-C.3, Optical Fiber Cabling Components Standard
- 1.3.12. ANSI/TIA – 568-C.2-1 Transmission Performance Category 6a Cabling Specifications for 4-Pair 100 Ω Category 6a Cabling, provided the accuracy requirements for level III field testers; Category 6a

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- 1.3.13. ANSI/TIA – 569A Commercial Building Standard for Telecommunications Pathways and Spaces
- 1.3.14. ANSI/EIA/TIA – 606 The Administration Standard for the Telecommunications Pathways and Spaces
- 1.3.15. ANSI/EIA/TIA – 607 Commercial Building Grounding and Bonding Requirements for Telecommunications
- 1.3.16. ANSI/TIA – 598 Color Coding of Optical Fiber Cables
- 1.3.17. EIA/TIA TSB – 67 Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems
- 1.3.18. BICSI – Building Industry Consulting Service International publications:
 - 1.3.18.1. Telecommunications Distribution Methods Manual
 - 1.3.18.2. LAN and Internetworking Design Manual
 - 1.3.18.3. Telecommunications Cabling Installation Manual
 - 1.3.18.4. Customer Owned Outside Plant Design Manual
 - 1.3.18.5. Manufacturer’s recommendations and installation guidelines
- 1.3.19. All cabling shall comply with all appropriate requirements of NEC Articles 770 and 800 and shall comply with the State Fire Codes as interpreted by the State Fire Marshall’s Department.
- 1.3.20. All publications referred to in this document shall be the latest publicized edition.

1.4. DEFINITIONS

- 1.4.1. Contractor – The entity responsible for performing or overseeing the installation and configuration of the system.
- 1.4.2. District – Long Beach Unified School District
- 1.4.3. District Approved Equal – A product that the Contractor submitted as equal to or greater than the product specified, which subsequently received District approval for use on the intended project. Refer to Division 01s for additional information
- 1.4.4. District Standard – a design or brand that has been selected by the District Board as the acceptable product.
- 1.4.5. District Technology Representative – An individual from the District’s Facilities Technology Group. They should possess an official @lbschools.net email address.
- 1.4.6. District Representative – An authorized individual representing the district, for example a project manager or construction manager.
- 1.4.7. Hard Lid – A fixed ceiling where the ceiling material is affixed directly to the underside of roof framing.
- 1.4.8. Integrator – The entity performing the physical installation and configuration of the system, who may be a sub-contractor of the Contractor.
- 1.4.9. Intermediate Distribution Frame (IDF)
 - 1.4.9.1. An intermediate termination points for horizontal wiring and cross connections normally within another structure separate from the MDF.

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1.4.10. Main Distribution Frame (MDF)

1.4.10.1. A physical concentration or central location for terminating backbone cables to interconnect with local exchange carrier (LEC) equipment at the activity minimum point of presence. The MDF includes vendor specific components to support voice and data circuits, building surge protector assemblies, main cross connects blocks, equipment support frames, and plywood backboard (if MDF is wall mounted). Depending upon local site conditions, the MDF and IDF may be identical.

1.4.11. Owner – The District’s Technology Information Services Branch (TISB), who will oversee the system after turnover.

1.4.12. UPS - Uninterrupted Power Supply

1.4.12.1.

1.5. SUBMITTALS

1.5.1. Product Data and Shop Drawings

1.5.1.1. Integrator to submit shop drawings with device locations and cable routes prior to installation.

1.5.1.2. Submit product data and manufacturer’s installation instructions.

1.5.2. Certificates

1.5.2.1. Contractor shall hold and maintain, through the completion, commissioning, closeout, and warranty period of the project, manufacturer's certification for the Structured Cabling System.

1.5.2.1.1. Installers shall be CommScope Uniprise certified or certified by a District Approved Equal for copper horizontal cabling. Installers shall be Corning certified, CommScope certified, or certified by a District Approved Equal for fiber. Include written certification from users that systems have performed satisfactorily for not less than 18 months.

1.5.2.2. The Contractor must be certified with the manufacturer for the Structured Cabling System for at least twelve (12) months prior to bid.

1.5.2.3. The Contractor shall provide proof of certification to the District during bid time.

1.5.2.4. At minimum, the Contractor’s qualifications for manufacturer’s certification shall include:

1.5.2.5. Provide BICSI Registered Communications Distribution Designer (RCDD) approved drawings complete with wiring diagrams and details required to prove that the distribution system shall properly support connectivity from the MDF to the IDF to the work area outlets.

1.5.2.6. Submit specific experience in installing and testing structured cabling distribution systems using fiber optic and Category 6a rated or higher, cabling systems. Provide current certification for installing technicians.

1.5.2.7. Contractor shall submit documentation providing proof of calibration and the latest software version of all test equipment.

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1.5.2.8. Provide a complete and detailed test plan for the structured cabling system including a complete list of test equipment for the Category 6a and fiber optic cable components and accessories. Include procedures for validation, and testing. Provide current certification for testing technicians.

1.5.2.8.1. Submit factory reel tests for fiber optic cables.

1.5.2.8.2. Cabling shall be fully terminated from end to end (installed in faceplates and installed into patch panels, NEMA rated wall boxes and/or raceway). Prior to finalized testing, pretests will not be accepted as the final report.

1.5.2.8.3. Submit certification of staff to utilize listed testing equipment

1.5.2.8.4. Submit factory test results for patch cords.

1.5.2.8.5. Submit specific experience in installing and testing structured cabling distribution systems using fiber optic and Category 6a or higher, cabling systems.

1.5.3. Qualification Statements

1.5.3.1. Submit Contractor's experience and qualifications, which shall include three (3) years of projects of similar complexity. Include names and locations of two projects successfully completed.

1.5.3.2. Submit documentation indicating Contractor has been in the telecommunication contracting business for a minimum of five (5) years under the same name and are located within two hundred (200) miles of the District.

1.5.3.3. Installers shall be CommScope Uniprise certified or a District Approved Equal. Submit written certification from users that systems have performed satisfactorily for no less than 18 months.

1.5.3.4. Include specific experience in installing and testing structured telecommunications distribution systems using fiber optic and Category 6a cabling systems.

1.5.4. Refer to Section 01 33 00 for additional submittal requirements.

1.6. CLOSEOUT SUBMITTALS

1.6.1. Documentation to be submitted upon completion:

1.6.1.1. Upon completion of installation, the Contractor shall prepare and submit "as-built" drawings of the system. As-builts shall be of each floor plan indicating exact device locations, panels, cable routes and wire numbers as tagged.

1.6.1.2. Provide Electronic copy of "as built" drawings in AutoCAD and PDF formats.

1.6.1.3. O&M: Submit complete operations and maintenance manuals. Include required maintenance and maintenance schedule.

1.6.1.4. For each campus, provide one (1) portable document file (PDF) showing schematic of structured cable system including cabling, IDF's, MDF's, and equipment rooms. Drawings shall depict:

1.6.1.4.1. Shop and As-Built drawings shall depict District approved structured communications cable system identifications and administration labeling scheme.

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1.6.1.4.2. As-Built drawings shall depict all final structured cabling configurations, including locations, cable counts and IDF locations after completed structured cable installation.

1.6.1.5. Electronic copies of Certification Test Results shall be provided to the District Representative within ten (10) days of cable installation completion.

1.6.1.6. Electronic copies of Certification Test Results shall be provided to the District Representative in PDF and native format.

1.6.1.7. 25 Year Warranty of Structured Cabling System shall be provided to the District Representative within ten (10) days of final Test Results. Coordinate with District Representative.

1.6.2. Refer to Section 01 77 00 for additional requirements.

1.7. DELIVERY, STORAGE, AND HANDLING

1.7.1. Store materials so that they are protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1.7.2. Repair or replace damaged components prior to Substantial Completion of the project.

1.8. WARRANTY

1.8.1. The installation must be certified to meet the latest available manufacturer system warranty program requirements for an extended warranty of twenty-five (25) years minimum duration. The performance warranty shall warrant the installed horizontal and backbone copper portion of the system and, as applicable, the installed horizontal and backbone fiber optic portions of the system. All such links and segments shall be warranted in accordance with the latest applicable requirements as defined by TIA.

1.8.2. The Contractor shall warrant the workmanship and installation of the system for one (1) year.

1.8.3. All major component failures must be replaced within a four-hour period. A major component shall be considered any component that affects fifty or more user devices.

1.8.4. The Contractor must provide a four-hour response time to problem calls. Response time is defined as on-site presence of authorized maintenance personnel equipped with appropriate spare parts and diagnostic tools.

1.8.5. During the warranty period, the Contractor shall maintain adequate stock of potential replacement parts to service the system should component failure occur.

2. PRODUCTS

2.1. SYSTEM DESCRIPTION

2.1.1. All new fiber optic cable and fiber optic patch cords, hardware and termination equipment shall be manufactured by Corning, CommScope, or District Approved Equal.

2.1.2. All new horizontal cabling, patch cords, hardware and terminating equipment shall be manufactured by CommScope Uniprise or District Approved Equal.

2.1.3. The horizontal and backbone cabling system includes the interconnecting cabling and sleeves between rooms, terminal hardware for connectivity between the MDF and/or IDFs and the work area outlet.

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- 2.1.4. The backbone system shall be wired in a star topology with the MDF at the center or hub of the star.
- 2.1.5. Hardware and terminating equipment shall consist of UL approved: Category 6a patch panels, jacks, and fiber optic terminating equipment
- 2.1.6. Backbone cable shall consist of armored indoor/outdoor (plenum rated only where required by code) Multimode fiber optic cable. Armored fiber optic cable shall be OM4 laser-optimized 50/125µm.
- 2.1.7. All single fiber optic backbone cable shall not exceed a maximum distance of 5 kilometers (approximately 3.1 miles). All indoor/outdoor rated fiber optic cable shall be U.L. (Underwriters Laboratories) listed.

2.2. STRUCTURED CABLING

- 2.2.1. Cabling shall be UL listed for the application and shall comply with TIA-568 (most current) standards and NFPA 70. Provide a labeling system for cabling as required by TIA-606 (most current) standard and District Standard (Refer to Section 3.10). Cabling manufactured more than twelve (12) months prior to date of installation shall not be used.
- 2.2.2. Fiber Optic Multimode Backbone Cabling
 - 2.2.2.1. Shall be armored indoor/outdoor (plenum only where required by code), armored tight buffeted 12 strands minimum, OM4 laser-optimized 50/125µm. Performance for laser-optimized 50/125µm fiber optic cable shall be compliant with IEEE 802.3ae standard for 10 Gigabit transmissions up to 400 meters.
- 2.2.3. Horizontal Cabling
 - 2.2.3.1. Shall consist of Category 6a UTP four pair cable.
 - 2.2.3.2. Shall match criteria and performance ratings of the existing cables.
 - 2.2.3.3. Shall be plenum rated where required by code.
 - 2.2.3.4. The maximum distance between the telecommunications outlet and the horizontal cross connect shall be no more than 90 meters. The maximum length of all patch cords, both in the telecommunications closet and at the work area, shall be no more than 10 meters.
 - 2.2.3.5. Comply with NFPA 70 and performance characteristics in TIA-568 (most current) standards, four-pair 100 ohm.
 - 2.2.3.6. All jumpers, patch cords, equipment cords, connecting hardware and connectors shall meet all applicable standards as specified in ANSI/TIA/EIA 562-C.2 and C.3.
 - 2.2.3.7. Category 6a UTP rated cable for local area networks shall exceed TIA-568 (most current) standards.
 - 2.2.3.8. Cable jacket shall be Blue (CommScope Uniprise or District Approved Equal) Category 6a for Structured cabling system.
 - 2.2.3.9. Cable jacket shall be Aqua (CommScope Uniprise or District Approved Equal) Category 6a for Intercom and Clock system.
 - 2.2.3.10. Cable jacket shall be Yellow (CommScope Uniprise or District Approved Equal) Category 6a for Camera system.

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2.2.3.11. Cable jacket shall be Purple (CommScope Uniprise or District Approved Equal) Category 6a for Extron AV system.

2.2.4. Fiber Optic Cabling

2.2.4.1. All indoor/outdoor rated fiber optic cable shall be plenum rated only where required by code and U.L. listed.

2.2.4.2. New fiber optic backbone cable extending shall consist of indoor/outdoor plenum rated Single Mode OS2 fiber optic cable.

2.2.4.3. Fiber optic backbone cable exceeding 400 meters shall consist of indoor/outdoor rated Single mode armored fiber optic cable.

2.2.5. Category 6a Patch Cables

2.2.5.1. Patch cables (CommScope Uniprise or District Approved Equal) for unshielded twisted pair cable shall be Category 6a rated and shall be equipped with factory-attached connectors to interconnect equipment mounted on the racks of the distribution frame and to connect computer stations to outlet locations.

2.2.5.2. Quantity of patch cords required for 100% port population at both ends plus 15% spare.

2.2.5.3. Patch cords (CommScope Uniprise or District Approved Equal) footage shall be 1 meter, 2 meters, and 5 meters.

2.2.5.4. Unless otherwise stated, the Structured Cable Contractor shall deliver:

2.2.5.4.1. MDF/IDF Patch Cords - Category 6a,

2.2.5.4.1.1. Blue in color for Structure Cabling.

2.2.5.4.1.2. Yellow in color for Security Camera System.

2.2.5.4.1.3. Aqua in color for Intercom/Clock.

2.2.5.4.1.4. White in color for Wireless Access Points.

2.2.5.4.1.5. Purple in color for Extron AV system.

2.2.5.4.1.6. Yellow in color for Aiphone system.

2.2.5.4.2. Workstations – Category 6a, blue in color, 20-foot length.

2.2.5.4.3. CCTV– Category 6a, yellow in color.

2.2.5.4.4. Intercom/Clock – Category 6a, aqua in color.

2.2.5.4.5. Wireless Access Points - Category 6a, white in color

2.2.5.4.6. Extron AV System – Category 6a, purple in color

2.2.5.4.7. Aiphone System – Category 6a, yellow in color.

2.2.6. Fiber Optic Patch Cables

2.2.6.1. Fiber Optic Patch Cables shall be single mode patch cords, pre-made to connect fiber optic equipment with fiber optic cross connects, interconnects, and outlets.

2.2.6.2. The patch cords (jumpers) shall be impact-resistant, duplex fiber cables with LC to LC connectors, of the same performance characteristics as the single mode armored fiber backbone being connected.

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- 2.2.6.3. Fiber patch cords shall be manufactured by Corning or CommScope. Manufacturer to match the installed fiber.
- 2.2.6.4. These fiber optic patch panel connections shall provide 0.4 dB or less insertion loss and provide connection between the Active LAN devices and the fiber optic patch panel. Quantities for 100% fiber strand population at both ends plus 15% Spares.
- 2.2.6.5. Unless otherwise stated the Structured Cable Contractor shall deliver:
 - 2.2.6.5.1. IDF Patch Cords LC - LC connectorized, single mode, duplex, fiber optic patch cord.
 - 2.2.6.5.2. MDF Patch Cords LC - SC connectorized, single mode, duplex, fiber optic patch cord.

2.3. PATCH PANELS

- 2.3.1. Copper Patch Panels
 - 2.3.1.1. Patch panels shall be rack mounted, rated to exceed TIA Standard for Category 6a modular patch panels each wired to terminate modular jacks per the TIA T568B standard.
 - 2.3.1.2. Quantities of jacks are based on the number of Category 6a cables originating at wall outlets and terminating at the patch panel plus 15% spares.
 - 2.3.1.3. 48 port patch panels shall be 48 port capacity.
 - 2.3.1.4. Patch panels shall be black in color.
 - 2.3.1.5. Copper Patch Panel Manufacturer: CommScope Uniprise
 - 2.3.1.6. All patch panels shall be grounded.
 - 2.3.1.7. All unused patch panel openings shall have blanks installed.

2.4. CABLE MANAGEMENT

- 2.4.1. All equipment cabinets shall be equipped with horizontal cable management organizers for each fiber optic patch panel and Category 6a cable patch panel.
- 2.4.2. Horizontal cable managers shall be designed to extend past the frame to allow placement of equipment in any position within the rack. When mounted between equipment rack frame rails, they shall be securely mounted to equipment rack frame rails.
- 2.4.3. All equipment cabinets shall be equipped with horizontal cable management organizers for each fiber optic and UTP patch panel.
- 2.4.4. Horizontal cable managers shall be single-sided with black finish and 2 rack units in height. Horizontal cable managers shall have cable pass-through, removable hinged cover, and evenly spaced "fingers" designed to maintain and allow the entry and exit of jumper, patch, or cross-connect cables and/or wires in place.
- 2.4.5. Horizontal Cable Manager Manufacturer: CommScope Uniprise or District Approved Equal.

2.5. FIBER OPTIC PATCH PANELS

- 2.5.1. Provide panels for maintenance and cross connecting of fiber optic cables.

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- 2.5.2. Patch panels shall be constructed of 0.125-inch minimum aluminum and shall have connectors which interface the inside plant fiber optic jumper cable with the outside plant fiber optic cable.
- 2.5.3. Patch panels shall be equipped with engraved laminated plastic nameplates above each connector.
- 2.5.4. Rack-mounted fiber patch panels shall be equipped to terminate or splice the incoming inter-building fiber and any required backbone or interconnect cables.
- 2.5.5. Each cable must be properly dressed.
- 2.5.6. These patch panels will terminate the fiber optic cables, provide a place for jumper cables and provide room to terminate additional optics.
- 2.5.7. Patch panels shall provide capacity for a minimum of 12 fiber optic strands. Larger capacity patch panels shall be determined at site walks.
- 2.5.8. Patch panels shall be 100% populated with type LC couplers and adapter plates. All connectors and couplers will be type LC.
- 2.5.9. The fiber optic patch panel connections shall provide 0.4 dB or less insertion loss.
- 2.5.10. All patch panels shall be grounded.

2.6. WALL MOUNTED EQUIPMENT SUPPORT CABINET

- 2.6.1. Fully enclosed lockable, modular type steel construction and treated to resist corrosion.
- 2.6.2. Minimum weight capacity of 300 lbs.
- 2.6.3. IDF cabinets shall be wall mount/swing out type and provide 19" rack mounting.
- 2.6.4. Rack shall be designed to allow for left or right-hand swing. Dimensions shall be a minimum of 36"H X 24" W X 30" D.
- 2.6.5. Manufacture: Hoffman, Tripp Lite, or District Approved Equal.
- 2.6.6. In selected cases, a 48" high cabinet will be used. Larger cabinet size will be determined on a project-by-project basis.
- 2.6.7. Cabinet shall be mounted on a fire rated plywood backboard in location to be determined.
- 2.6.8. When wall-mounted cabinets are installed in classrooms, the Contractor shall be responsible for providing and installing Acoustical Absorber foam material on the inside and back of the cabinet. Acoustical Absorber shall be flexible, ½" thick, polyurethane, adhesive backed foam.
- 2.6.9. Install electrical strip inside each cabinet. Top to bottom. One in front and one in rear.
- 2.6.10. Contractor shall be responsible for determining correct cabinet mounting and anchoring methods that will safely support the combined weight of the cabinet and data network components that will occupy the cabinet.
- 2.6.11. Cabinet mounting and anchoring methods shall comply with the District Representative and State building and safety codes.
- 2.6.12. Drywall screws shall not be used for mounting cabinets.
- 2.6.13. Contractor shall be responsible for ensuring that cabinet mounting and anchoring methods are per manufacturers recommendations. Manufacturer: Tripp Lite, Hoffman Access Plus II Type 1 Double-Hinged Wall-Mount Cabinet, or District Approved Equal.

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- 2.6.14. Contractor shall be responsible for proper grounding of the cabinets per the most current ANSI/TIA 607 standard.
 - 2.6.14.1. Rack / Cabinet horizontal busbar Hubbell or equal.
 - 2.6.14.2. Device ground kit Hubbell (part# - length in inches) or equal per device installed
 - 2.6.14.3. Ground conductor Kit Hubbell (part# - length in inches) or equal for cabinet grounding to bus bar, electrical service panel or building steel

2.7. MDF CABINETS / FREE STANDING

- 2.7.1. The unit shall be designed to provide a secure, managed environment for computer and networking equipment.
- 2.7.2. Minimum weight capacity of 1500 lbs.
- 2.7.3. The unit shall be UL Listed and conform to EIA-310D Standard for Cabinets, Racks, Panels and Associated Equipment and accommodate industry standard 19" wide rack mount equipment.
- 2.7.4. The unit shall be designed with four (4) vertical posts to allow rack mount equipment installation utilizing four (4) vertical mounting rails.
- 2.7.5. The unit shall provide 42U of equipment vertical mounting space (1U=1.75" or 44.45mm).
- 2.7.6. The vertical mounting rails shall be adjustable to allow different mounting depths.
- 2.7.7. The unit shall include at least 50 sets of mounting screws, caged nuts, bolts and cup washers, and caged nut installation tool for the mounting of equipment inside the unit.
- 2.7.8. Both front and rear doors shall consist of quick release hinges allowing for quick and easy detachment without tools.
- 2.7.9. The front and rear doors shall open a minimum of 180 degrees to allow easy access to the interior.
- 2.7.10. The front and rear doors shall be reversible so that they open from either side.
- 2.7.11. The base unit shall include removable side panels that are removed without tools using easy finger latches for fast access to cabling and equipment.
- 2.7.12. All weight bearing components shall be constructed from steel no less than 0.9mm (20 gauges).
- 2.7.13. All metal parts shall be painted using a powder coat paint process.
- 2.7.14. Plastic materials shall comply with Underwriters Laboratory Specification 94 with V-1 rating (UL94 V-1) or better.
- 2.7.15. Provisions shall be provided for all enclosure panels and rack-mounted equipment to be earthed or grounded directly to the frame.
- 2.7.16. Unit shall include a grounding kit containing terminated green/yellow jumper wires and associated hardware.
- 2.7.17. Units shall be equipped with vertical wire management rings, not to exceed 12" between rings, installed at both the front and rear of the cabinet.
- 2.7.18. Each cabinet installed shall have one (19"W x 3"D x 3"H) horizontal wire manager installed at top/rear portion of the cabinet.

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- 2.7.19. Units shall be equipped with perforated front and rear doors, perforated top and solid side panels.
- 2.7.20. Baying brackets shall be provided where multiple mounting cabinets are to be mounted together.
- 2.7.21. Cabinet Frame with front and rear mesh doors.
- 2.7.22. "Side Panels" required.
- 2.7.23. Unit shall have base dimension of 84 inches in height by 31.50 inches in width by 41.86 inches in depth.
- 2.7.24. Units shall be black in color.
- 2.7.25. Cabinets shall be seismic/earthquake braced and anchored to floor.
- 2.7.26. Each campus MDF shall include two free standing equipment server cabinets.
- 2.7.27. Manufacturer: Tripp Lite SR2400 or District Approved Equal
- 2.7.28. Contractor shall be responsible for proper grounding of the cabinets per the most current 607 standard.
 - 2.7.28.1. Rack / Cabinet vertical busbar Hubbell # HGRKTVC or equal.
 - 2.7.28.2. Device ground kit Hubbell # HGRKD##N (## - length in inches) or equal per device installed.
 - 2.7.28.3. Ground conductor Kit Hubbell # HGRKTDA##DA (## - length in inches) or equal for cabinet grounding to electrical service panel or building steel.
 - 2.7.28.4. Ground conductor Kit Hubbell # HGRKTDA##DA (## - length in inches) or equal for cabinet busbar grounding to electrical service panel or building steel.

2.8. MDF EQUIPMENT CABINET ACCESSORIES

- 2.8.1. Each equipment cabinet shall come equipped with two 5-foot power distribution strips with (10) 20-amp (NEMA 5-20R) receptacles mounted 6 inches on center.
- 2.8.2. MDF Cable Runway
 - 2.8.2.1. Cable runway shall be installed in new campus MDF Rooms. Size: 12-inch-wide, plus side channel, as needed.
 - 2.8.2.2. Classified by Underwriters Laboratories (UL) as suitable for equipment grounding.
 - 2.8.2.3. Cable runway shall be used for voice and/or data and video communications cabling only. No electrical wiring shall be placed in cable runway with voice and data cabling.
 - 2.8.2.4. Wall angle supports shall be steel angles. Ends to be smooth without hooks or projections. Brackets shall be able to support an end load of 600 lb. with a safety factor of 1.65.
 - 2.8.2.5. Elbows, Tee's, 90-degree bends and crosses: All horizontal and vertical 90-degree elbows, tees, 90-degree bends and crosses shall be made with right angle couplings, which clamp to the runway without the need for drilling or cutting.

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- 2.8.2.6. At all horizontal 90-degree bends, tees, and crosses, provide adjustable junction splice kits for large radius cable bends.
- 2.8.2.7. Seismically supported by end wall supports, angular wall supports and communications equipment cabinets.
- 2.8.2.8. Black baked enamel finish.
- 2.8.2.9. Manufacturer: Chatsworth Products (12") or District approved equal.

2.9. OUTLET/CONNECTOR ASSEMBLIES

- 2.9.1. Jacks shall comply with FCC Part 68.5, and TIA-568 (most current) standards.
- 2.9.2. Jacks shall accommodate Category 6a or fiber optic cable and work in concert with Wiremold 5500 raceway or District approved equal.
- 2.9.3. UTP jacks shall be RJ-45 designation T568B type, UL 1863 listed, eight position, constructed of high impact rated thermoplastic housing rated for Category 6a service.
- 2.9.4. Jacks for data shall be Category 6a hardware and shall comply with the attenuation requirements contained in TIA-568 (most current) Standard.
- 2.9.5. Jacks shall be:
 - 2.9.5.1. Blue in color for Structured Cabling.
 - 2.9.5.2. Yellow in color for Security Cameras.
 - 2.9.5.3. Aqua in color for Intercom/Clock.
 - 2.9.5.4. White in color for Wireless Access Points.
 - 2.9.5.5. Purple for Extron AV.
 - 2.9.5.6. Orange in color for Electronic Locks
 - 2.9.5.7. Yellow in color for Aiphone system.
- 2.9.6. Telecommunications face plates shall comply with UL 514C, and TIA-568 (most current) standard; flush design constructed of high impact thermoplastic material.
- 2.9.7. Structured cabling faceplate colors shall be ivory. Structured cabling faceplates shall be available in 2-port, 4-port and 6-port single-gang configurations.
- 2.9.8. All unused faceplate openings shall have blanks installed.
- 2.9.9. Jacks shall be orientated on the patch panel starting at the top left and proceeding in a left to right, top to bottom order.

2.10. NON-METALLIC SURFACE MOUNTED RACEWAY

- 2.10.1. Conceal cable sleeves within walls whenever possible.
- 2.10.2. Unless otherwise indicated, raceway shall be three channel, Wiremold 5500 or District Approved Equal, with all necessary brackets, adapters, connectors, hardware and equipment to install CommScope Uniprise, or District Approved Equal, certified Structured Cabling systems as described above.
- 2.10.3. Raceway shall be ivory in color or as noted on drawings.
- 2.10.4. Notching or modifications of raceway will not be permitted.
- 2.10.5. Proper screws and anchors shall be used to mount raceway.

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2.10.6. Manufacturer: Wiremold or District Approved Equal.

2.11. NON-CONTINUOUS CABLE SUPPORT

2.11.1. Material

- 2.11.1.1. Contractor shall provide and install all non-continuous cable supporting hardware.
- 2.11.1.2. Non-continuous cable supporting hardware consists of J-hooks, multi-function clips, beam clamps, etc. Bridle rings or zip ties are not permitted.
- 2.11.1.3. Non-continuous cable supports shall provide a load bearing surface of sufficient width to comply with required bend radii of high-performance cables; UL Listed. Bridle rings are not permitted.
- 2.11.1.4. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.
- 2.11.1.5. Non-continuous cable supports sized 1 5/16" and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces.
- 2.11.1.6. Non-continuous cable supports shall have an electro-galvanized or G60 finish and shall be rated for indoor use in non-corrosive environments.
- 2.11.1.7. Multi-tiered non-continuous cable support assemblies shall be used where separate cabling compartments are required. Assemblies may be factory assembled or assembled from pre-packaged kits. Assemblies shall consist of a steel angled hanger bracket holding up to six non-continuous cable supports, rated for indoor use in non-corrosive environments; UL Listed.
- 2.11.1.8. If required, the multi-tier support bracket may be assembled to manufacturer recommended specialty fasteners including beam clamps, flange clips, C and Z purlin clips, etc.
- 2.11.1.9. Tee-bar support bracket with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments.
- 2.11.1.10. Fastener to wire/rod with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments.
- 2.11.1.11. Fastener to beam or flange with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments.
- 2.11.1.12. Fastener to C or Z purlin with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments.
- 2.11.1.13. Fastener to wall, concrete, or joist with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments.
- 2.11.1.14. Fastener to threaded rod with one non-continuous cable support, factory or jobsite assembled, rated for indoor use in non-corrosive environments.
- 2.11.1.15. The multi-tiered support bracket shall have a static load limit of 300 lbs.
- 2.11.1.16. U-hooks and double J-hooks shall attach directly to threaded rod using standard nuts.

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2.11.2. Manufacturer: Copper B-Line, Erico Caddy, Doc's J-Hooks or District Approved Equal.

2.12. TELECOMMUNICATIONS BACKBOARDS

2.12.1. Provide fire rated plywood 3/4-inch-thick A/C Grade 48"H X 24" W for mounting of wall mounted cabinets.

2.12.2. Backboards shall be painted with a light color, nonconductive fire-resistant overcoat. Backboards shall be free of voids; fill and sand prior to painting.

2.12.3. Cabinet shall be mounted on a plywood backboard in location to be determined.

2.12.4. Contractor shall be responsible for determining correct backboard mounting and anchoring methods that will safely support the combined weight of the backboard, cabinet and data network components that will occupy the backboard.

2.12.5. Backboard mounting and anchoring methods shall comply with the District Representative and State building and safety codes.

2.12.6. Contractor shall be responsible for ensuring that cabinet mounting and anchoring methods comply with manufacturers' recommendations.

2.12.7. Drywall screws shall not be used to mount plywood backboards.

2.13. GROUNDING AND BONDING PRODUCTS

2.13.1. Comply with UL 467, ANSI/J-STD-607 (most current) standard, and NFPA 70. Components shall be identified as required by TIA-606 (most current) standard.

2.13.1.1. Manufacturer: Hubbell or District approved equal.

2.13.2. MDF

2.13.2.1. All MDF Racks shall be installed with a Grounding Busbar (TGB)

2.13.2.1.1. The TGB shall be installed in accordance with ANSI/J-STD-607 (most current) standard.

2.13.2.1.2. The TGB shall be grounded to the nearest access to the building ground with a #6 AWG insulated conductor.

2.13.2.2. Building ground is identified as main building electrical ground, building structural steel, or ground rod. Water pipes, gas pipes and electrical conduits are not acceptable ground attachment points.

2.13.2.3. Ground conductors are not to exceed 40 feet. If building ground connection is beyond 40 feet, Contractor is to install a new ground round at the nearest outside location. Ground rod location shall be approved by District Representative prior to installation.

2.13.2.4. Provide ohms testing for ground. Ground connections shall not exceed 5 ohms.

2.13.3. IDF

2.13.3.1. All IDFs shall be installed with a grounding busbar (TGB) the TGB shall be installed in accordance with ANSI/J-STD-607 (most current) standard. The TGB shall be grounded to the nearest building ground with a #6 AWG insulated conductor.

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2.13.3.2. Building ground is identified as main building electrical ground, building structural steel, or ground rod. Water pipes, gas pipes and electrical conduits are not acceptable ground attachment points.

2.13.3.2.1. Ground conductors are not to exceed 40 feet. If building ground connection is beyond 40 feet, Contractor is to install a new ground round at the nearest outside location. Ground rod location shall be approved by District Representative prior to installation.

2.13.3.2.2. Provide ohms testing for ground. Ground connections shall not exceed 5 ohms.

2.14. FIRESTOPPING MATERIAL

2.14.1. Contractor shall provide all necessary fire stopping of openings through which cable is installed under this specification, in accordance with NFPA 70 and all local codes. This includes installation in conduits, raceways, or bare penetrations. Provide and install UL 1479 approved (Fire Barrier Caulk) firestop material.

2.14.1.1. Manufacturer: 3M, STI or District approved equal.

2.15. POWER STRIP(S)

2.15.1. Install 12 outlet, 15A 120v Vertical Rackmount Surge Protector at every equipment rack / cabinet in IDF, Tripp-Lite ISOBAR12ULTRA or District approved equal.

2.15.2. Manufacturer: Tripp Lite or District approved equal

3. EXECUTION

3.1. EXAMINATION

3.1.1. Coordinate layout and installation of voice, data, and video communication cabling with the District Representative, other Contractors, and equipment suppliers.

3.1.2. Structured Cable Contractor shall attend weekly project meetings.

3.1.3. Meet jointly with other Contractors, equipment suppliers, and the District Representative in order to exchange information and agree on details of equipment arrangements and installation interfaces.

3.1.4. Record agreements reached in meetings and distributed to other participants in a timely manner.

3.1.5. Adjust arrangements and locations of distribution frames, cross-connect and patch panels in equipment rooms and/or MDF/IDF rooms to accommodate and/or optimize the arrangement and space requirements of voice and LAN equipment.

3.2. HORIZONTAL DISTRIBUTION CABLE INSTALLATION

3.2.1. Telecommunications cabling and pathway systems, including the horizontal and backbone cable, pathway systems, telecommunications outlet/connector assemblies, and associated hardware shall be installed in accordance with TIA/EIA-568-C.1, C.2, C.3, (most current) standard, TIA 569-A, NFPA 70, and UL standard as applicable. If MDF and/or IDF do not have adequate capacity to support additional cable and termination hardware, Contractor shall provide and install new MDF/IDF cabinet.

3.2.2. Contractor shall provide all necessary tools and materials not specified, (Velcro wraps, "d" rings, screws, consumables, hardware, etc.) and equipment, (ladders, hydraulic lifts, storage containers, etc.) necessary to provide a complete and operating system.

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- 3.2.3. Installation methodologies shall adhere to manufacturer installation procedures to not violate certifications (i.e., UL).
- 3.2.4. All work shall be performed in a good workmanship-like manner leaving each location in the same or better condition as at the start of each project.
- 3.2.5. The designated District Representative shall be provided with progress reports.
- 3.2.6. Periodic on-site inspections will be done during installation.
- 3.2.7. The District reserves the right of “local jurisdiction” for final approval.
- 3.2.8. Do not exceed manufacturer’s cable pull tensions for copper and fiber optic cables. Provide a device to monitor cable pull tensions. Do not exceed 25 pounds pull tension for four pair copper cables.
- 3.2.9. Do not chafe or damage outer jacket materials.
- 3.2.10. Use only lubricants approved by cable manufacturer.
- 3.2.11. Do not over cinch cables, or crush cables with staples.
- 3.2.12. For Category 6a UTP cable, bend radii shall not be less than four times the cable diameter.
- 3.2.13. Pair untwist at the termination shall not exceed 3.18 mm (0.125 inch).
- 3.2.14. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
- 3.2.15. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
- 3.2.16. The cable jacket shall be maintained as close as possible to the termination point.
- 3.2.17. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed with removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.
- 3.2.18. Contractor is responsible for all interconnected patch cables from the patch panel to the existing network switch.
- 3.2.19. Contractor shall install new ¼” pull rope in all conduits at MDF/IDF.
 - 3.2.19.1. Pull rope shall be new ¼” polypropylene over polyester rope with a minimum 1700 lb. Tensile strength.
 - 3.2.19.2. Pull rope shall be new material that is free of knots, kinks, and abrasions and shall be placed as a single continuous length in every new conduit.
 - 3.2.19.3. Pull rope shall be secured at each end

3.3. OPEN CABLE INSTALLATION

- 3.3.1. Use only where specifically indicated on plans or determined during site surveys.
- 3.3.2. When not running surface mounted raceway or conduit, utilize non-continuous cable support above suspended ceilings and in all ceiling spaces.
- 3.3.3. Install cabling above suspended ceilings 6 to 12 inches above ceiling T-Bar using non-continuous cable support spaced on 24 to 48-inch centers and securely attached to structural ceiling.

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- 3.3.4. Do not exceed cable pull tensions recommended by the manufacturer.
 - 3.3.4.1. Avoid routing copper cable in areas where there may be high levels of electromagnetic interference (EMI). EMI is caused by AC power lines, broadcast signals, x-ray equipment, motors, generators, and fluorescent lighting fixtures.
 - 3.3.4.2. Cables shall be placed in non-continuous cable support every 2 to 4 feet, if they are separately bundled and tie-wrapped using Velcro ties.
 - 3.3.4.3. Cabling shall be organized and identified to facilitate locating and handling individual sheaths for maintenance functions.
 - 3.3.4.4. Each bundle shall be neatly tied without over cinching and stressing cable.
 - 3.3.4.5. Bundles shall be clearly marked identifying the IDF and room to which routed, the station numbers served by the bundle, and any other information that may assist in administration.
 - 3.3.4.6. Great care shall be taken to protect all cabling from physical damage.
 - 3.3.4.7. A 20-foot service loop shall be installed above the ceiling on each cable installation where possible.

3.4. PATHWAY INSTALLATIONS

- 3.4.1. Comply with TIA/EIA-569-A, NEC and CEC.
- 3.4.2. Shall be installed in accordance with NEC Article 314 and Article 800.51 (J), (K), or (L), as applicable, and installed in accordance with Articles 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing apply.
- 3.4.3. Conceal interior conduit under floor slabs and within finished walls, ceilings and floors where possible.
- 3.4.4. Keep conduit minimum 6 inches away from parallel runs of electrical power equipment, flues, steam, and hot water pipes.
- 3.4.5. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit is visible after completion of project.
- 3.4.6. Run conduits in crawl spaces and under floor slabs as if cable is exposed.
- 3.4.7. Install no more than two 90-degree bends for a single horizontal cable run.
- 3.4.8. Run conduits and surface mounted raceway as determined by site survey or as noted on drawings.
- 3.4.9. Provide pull boxes with "Sealtight" flex conduit only where flexible connections are required. District approval required prior to all "Sealtight" flex conduit installation.
- 3.4.10. Provide all coring, patching, and painting as needed for Intra-Building and Inter-Building pathways. Caulking is not an acceptable patching method for conduit penetrations into exterior walls. Coordinate with District for acceptable patching methods.

3.5. UNDERGROUND PULL BOXES AND PULL BOXES

- 3.5.1. Underground pull boxes shall be made of concrete and the minimum size shall be 35 ½" W x 17 ½" H x 12" D.
- 3.5.2. Underground pull covers shall be rated for traffic (type T.05) and shall be marked "COMMUNICATIONS".

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- 3.5.3. Metal covers shall be used in all locations subject to vehicle traffic.
- 3.5.4. Gravel shall be installed below all ground boxes for drainage.
- 3.5.5. Ground boxes and pull boxes shall not be placed in areas subject to flooding.
- 3.5.6. Establish drainage to meet Public Works Construction Standards (Green Book).
- 3.5.7. Unless otherwise noted, pull boxes shall have minimum dimensions of 20" H x 20" W x 6" D.
 - 3.5.7.1. Interior pull boxes shall consist of 16-gauge steel minimum, unless otherwise noted on plans.
 - 3.5.7.2. Indoor enclosures shall conform to NEMA Type 4, unless otherwise noted.
 - 3.5.7.3. Size pull boxes to not less than minimum Code requirements. Increase size above Code requirements where necessary to provide space for pulling, racking or splicing enclosed conductors, or where specified or indicated dimensions exceed Code requirements.
 - 3.5.7.4. Exterior metal pull boxes exposed to weather (and not installed in or below grade) shall be equipped with rain-tight or weather-proof hinged doors.
 - 3.5.7.5. Exterior pull boxes shall have 16-gauge steel bodies and 14-gauge steel doors.
 - 3.5.7.6. Exterior pull boxes shall be equipped with external mounting feet.
 - 3.5.7.7. Exterior pull boxes shall be equipped with stainless steel door clamps on three sides and a removable stainless-steel continuous hinge pin.
 - 3.5.7.8. Exterior pull boxes shall be equipped with a hasp and staple for padlocking.
 - 3.5.7.9. Enclosures installed on vertical exterior walls shall conform to NEMA Type 3R.
 - 3.5.7.10. Enclosures installed on horizontal exterior surfaces such as rooftops or breezeways shall conform to NEMA Type unless otherwise noted.
 - 3.5.7.11. Rain tight or weatherproof boxes shall use threaded watertight hubs for top or side entry and may use knockout for bottom entry only.
 - 3.5.7.12. Exterior pull boxes shall conform to these industry standards:
 - 3.5.7.12.1. UL 508 Type 4
 - 3.5.7.12.2. NEMA/EEMAC Type 3, Type 4, Type 12, Type 13
 - 3.5.7.12.3. NFPA 79
 - 3.5.7.12.4. CSA Type 4
 - 3.5.7.12.5. IEC 529, IP66
 - 3.5.7.13. Tamper resistant screws shall be used on all exterior, aboveground junction/pull boxes exposed to public/student areas.
 - 3.5.7.14. Exterior pull boxes shall be manufactured by Hoffman or District approved equal

3.6. COMMUNICATION DUCT-BANKS AND CONDUITS

- 3.6.1. Trenches
 - 3.6.1.1. All underground trenches shall be minimum 24" W x 30" D.

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- 3.6.1.2. Trenches shall be backfilled at 95% compaction.
- 3.6.1.3. Contractor shall restore surface to same or better condition
- 3.6.1.4. Contractor shall Dig Alert a minimum of 48 hours prior to excavation to verify the location of the existing underground utilities.
- 3.6.1.5. Modifications to pathway design may be dictated by field conditions subject to approval by the District.
- 3.6.1.6. Compaction testing notification must be provided to the District, 48 hours prior to testing so that a District inspector may be present.
- 3.6.1.7. Slurry fill trenches to within 3" (three inches) of finished grade whenever crossing paved areas. "Two Sack" slurry shall be used.
- 3.6.1.8. Pavement removal and patching shall conform to specifications and standards listed in the Public Works Standards (Green Book).
- 3.6.2. Conduit
 - 3.6.2.1. Underground conduit shall consist of Schedule 40 PVC – 2 inch inside diameter or Type C telephone conduit – 2 inch inside diameter (if concrete encased).
 - 3.6.2.2. One (1) Maxcell innerduct shall be placed in a 2-inch conduit. Maxcell innerducts are to be equipped with 1/8" pull ropes.
 - 3.6.2.3. Conduit shall have a factory formed bell on one end for interconnecting segments.
 - 3.6.2.4. Conduit located under heavy use highways or railroad rights-of-ways shall be encased in steel casing consistent with the AASHTO or AREA specifications. The thickness of the steel casing shall be engineered for each specific application. This may vary based on campus codes.
 - 3.6.2.5. Spacers: High impact spacers shall be used in all multi-duct systems, for both solely owned and joint telecommunications/power construction. They shall conform to NEMA TC-2, TC-6, TC-8, and ASTM F 512 dimensions.
 - 3.6.2.6. All fittings shall be designed specifically for use with the type of conduit placed.
 - 3.6.2.7. All conduits shall be equipped with seal plugs in all ground boxes and expansion rubber seal plugs within all buildings.
 - 3.6.2.8. A horizontal and vertical separation of 1 inch between the ducts shall be maintained by installing high impact spacers with horizontal and vertical locking intervals of ten feet.
 - 3.6.2.9. All communications conduits shall be placed uniformly between ground boxes and pull boxes. Conduit in position #1 at one ground box or pull box shall maintain its position within the duct run and terminate in the #1 position at the next box. The position of all conduits between ground boxes and pull boxes shall be maintained.
 - 3.6.2.10. Long radius bends (over 30 feet) shall be used whenever possible to make changes in direction. If it is found to be necessary to place a 90-degree bend in the conduit run, a factory-made sweep of no less than 60-inch radius shall be used.

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- 3.6.2.11. No conduit run shall exceed a total of 180 degrees of bend between any two points (such as utility holes or buildings) considering both vertical and horizontal sweeps.
- 3.6.2.12. Cold-formed trench bends shall have a radius of not less than 60 inches and shall pass mandrel integrity. Bend radius criterion is 2" or less 6 times the diameter of the conduit and any conduit larger than 2" is 10 times the diameter of the conduit.
- 3.6.2.13. The length and destination of all conduits shall be identified in each ground box, pull box and building. Embossed metal or heavy plastic tags strapped to each conduit shall be used.
- 3.6.2.14. After installation of communications conduits, the Contractor shall prove all conduits by pulling a mandrel with a diameter ¼" smaller than the conduit and 6 inches long through each conduit end-to-end. An inspector designated by the Contractor and the District shall be notified 24 hours before this procedure. Each conduit shall be cleaned with a bristle brush to remove any debris.
- 3.6.2.15. Utility marking tape shall be buried 12" below the surface directly above the conduit.
- 3.6.2.16. Where communications and power conduits occupy the same trench, all conduit structures shall be built with the telecommunications conduits placed above the power conduits and separated by a minimum of 12" of compact earth or 3" of concrete encasement, unless otherwise called out on construction drawings and approved by the District. If this type of construction is required, it shall receive the prior approval of the Contractor and the District.
- 3.6.2.17. Contractor shall install new ¼" pull rope in all conduits placed.
- 3.6.3. Overhead Conduit
 - 3.6.3.1. Where overhead conduit is required between or within buildings, Contractor shall utilize EMT conduit with an inside diameter of 2", unless otherwise specified.
 - 3.6.3.2. All fittings shall be compression type connectors and couplers designed specifically for use with the type of conduit placed.
 - 3.6.3.3. All fittings shall be watertight. Fitting types shall be pre-approved by the designated District representative. Unless pre-approved by the designated District representative, all conduits shall be installed by a qualified electrical Contractor who has at least five years' experience in similar installations within the Southern California area.
 - 3.6.3.4. Contractor shall install conduit at roof locations utilizing the current District approved methodology and process. All conduit pathways and locations must be approved by the District prior to installation.
 - 3.6.3.5. All roof penetrations must be approved by the District prior to installation.
 - 3.6.3.6. Contractor shall install new ¼" pull rope in all conduits placed.
- 3.6.4. Communications Entrance Conduit

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- 3.6.4.1. To prevent shear, all inter-building conduit (whether underground or aerial) shall transition from PVC to metal to Sealtite flex conduit when attaching to a permanent structure. The Contractor and the District shall determine the placement of all entrance conduit. All applicable standards shall be adhered to, i.e., District, NEC, BICSI, or G.O.128.
- 3.6.4.2. Sealtite flex conduit lengths shall not exceed 24", unless approved by the District.
- 3.6.4.3. Sealtite flex conduit may be used between adjacent bungalows within 24" of one another using District approved connectors and methods. Use of Sealtite flex conduit between bungalow locations beyond the 24" distance shall require written authorization from the District.
- 3.6.4.4. Contractor shall install new ¼" pull rope in all conduits placed.
- 3.6.5. Vertical Conduit
 - 3.6.5.1. Where vertical conduit is required between pull boxes or within buildings, Contractor shall utilize EMT conduit with an inside diameter of 2", unless otherwise specified.
- 3.6.6. Duct-bank locating cable (electronically detectable warning tape)
 - 3.6.6.1. Warning tape shall be a minimum of 3" wide, orange in color, and shall have a non-degradable imprint as follows:
 - 3.6.6.1.1. "Caution fiber optic cable buried down"
 - 3.6.6.1.2. The tape shall be electronically detectable
- 3.6.7. Pull rope
 - 3.6.7.1. Pull rope shall be new ¼" polypropylene over polyester rope with a minimum of 1700 lb. tensile strength.
 - 3.6.7.2. Pull rope shall be new material that is free of knots, kinks, and abrasions and shall be placed as a single continuous length in every conduit.
 - 3.6.7.3. Pull rope shall be secured at each end.

3.7. FIRESTOP

- 3.7.1. A firestop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure, and the materials and assembly of the materials used to seal the penetrated structure. Firestop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water steam.
- 3.7.2. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire-rated structure). Any penetrating item (i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc.) shall be properly firestopped.
- 3.7.3. All firestop systems shall be installed according to the manufacturer's recommendations and fully installed and available for inspection by the local inspection authorities prior to cable system acceptance.

3.8. DUCT SEALANT

- 3.8.1. Contractor shall install duct sealant in each end of underground duct bank conduits.

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- 3.8.2. All occupied and vacant communications duct bank conduits shall be sealed.
- 3.8.3. Each underground duct bank conduit entering underground pull boxes shall have duct sealant installed.
- 3.8.4. Each underground duct bank conduit stubbing up through building foundation shall have duct sealant installed.
- 3.8.5. Each underground duct bank conduit through the building wall shall have duct sealant installed.
- 3.8.6. Each underground duct bank conduit end shall be sealed to be 100% watertight.

3.9. BACKBOARD AND EQUIPMENT SUPPORT CABINET

- 3.9.1. Contractor shall coordinate the MDF/IDF backboard and equipment support cabinet mounting locations and mounting methods with the District. New MDFs shall be provided with 4 free standing equipment cabinets. Existing campuses may require wall-mounted equipment cabinets.
- 3.9.2. Free standing MDF equipment cabinets shall be seismically anchored to the floor and to the overhead cable runway.
- 3.9.3. Wall mounted equipment support cabinet shall be mounted on plywood backboard in location to be determined. Quantities and locations are to be coordinated with the District.
- 3.9.4. Contractor shall coordinate the required equipment support cabinet dimensions with the District.
- 3.9.5. Contractor shall provide and install fasteners and anchors that are designed and rated for determined mounting surface and building construction type.
- 3.9.6. Contractor shall provide and install fasteners and anchors that are designed and rated for the combined weight of the equipment support cabinet and its contents.
- 3.9.7. Contractor shall be responsible for determining correct cabinet mounting and anchoring methods that will safely support the combined weight of the cabinet and data network components that will occupy the cabinet.
- 3.9.8. Contractor shall install IDF/MDF plywood backboard and equipment support cabinet in such a manner that a minimum of 4 backboard fasteners and/or anchors are attached directly into wall framing studs or, if applicable, masonry wall.
- 3.9.9. Contractor shall install MDF/IDF equipment support cabinet in such a manner that a minimum of 4 cabinet mounting point fasteners attach the cabinet directly to the plywood backboard.
- 3.9.10. Contractor shall not use drywall screws as fasteners for backboard and cabinet.
- 3.9.11. Cabinet mounting and anchoring methods shall comply with the District and State Building and Safety Codes.
- 3.9.12. Contractor shall be responsible for costs of all repairs if equipment support cabinet installation methods are determined to be inadequate by the District or if Contractor provided and installed fasteners and/or anchors fail, resulting in the equipment support cabinet pulling away from wall or completely falling off of wall.

3.10. DATA SYSTEMS LABELING PROCEDURES

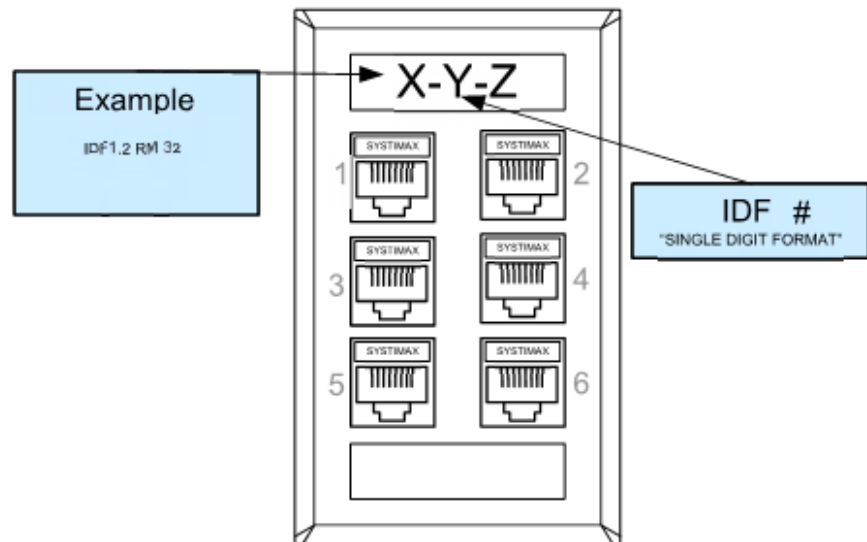
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- 3.10.1. Data systems labeling shall be in accordance with the TIA-606 standard and District standard.
- 3.10.2. Data systems labeling shall be computer software generated and printed with readable fonts and black ink on a white background.
- 3.10.3. The ink and label shall be water and smear-proof for both indoor and outdoor use.
- 3.10.4. Samples of each type of media showing label type, labeling format, font size and ink shall be submitted for District approval prior to use.
- 3.10.5. The Contractor shall label the cabling system as indicated in these specifications and in accordance with TIA-606 Standards and District Standards.
- 3.10.6. All label printing will be machine generated. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided by the termination device or housing.
- 3.10.7. Identification of cabling, pathways and hardware shall conform to TIA-606. The labeling scheme for the structured cabling system shall be submitted to the District for approval and inclusion in all matrices for building operations prior to trim/finish. Faceplate, insert, and dust cover shall be same color.
- 3.10.8. Each information outlet faceplate and each telephone and data cable shall be labeled following District standard. The labels shall be made of waterproof material and be mechanically printed with permanent black ink on a white background. The labels must be legible with the same identification numbering corresponding to both ends. Each information outlet faceplate has removable covers that hide the mounting screws. They are located above and below each pair of module knockouts. The approved adhesive-backed label should be placed on the outside of the top removable cover. The generic CommScope Uniprise cover that comes with the faceplate should be used below the lower knockouts. At the MDF, the telephone cabling shall be labeled on the protector blocks with black indelible ink in numerical order. Data cabling at the MDF/IDF closet should be labeled with mechanically printed labels both on the wire and on the patch panels utilizing specified label strips. Labeling products must be approved by the District prior to use.
- 3.10.9. The standard District Telecommunications and Networking outlet label format consists of: Room#-IDF#-Cable I.D.#
 - 3.10.9.1. Room # - Designates the room where the terminal closet is located.
 - 3.10.9.2. IDF # - Designates the closet on the floor from which the outlet is served.
 - 3.10.9.3. Cable I.D. # - Designates the individual outlet number used to identify the cable on both ends.

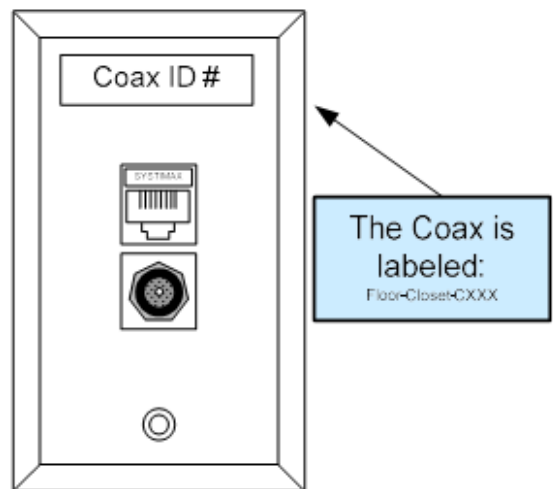
Samples of labeling formats are provided on the next few pages.

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Sample Faceplate Labeling Formats – confirm Labeling Requirements with District

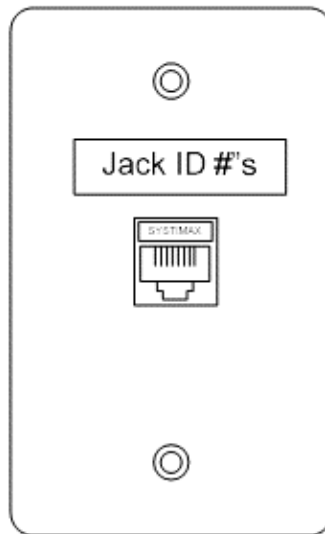


1. Faceplate Configurations – Figure 1



2. Faceplate Configurations – Figure 2

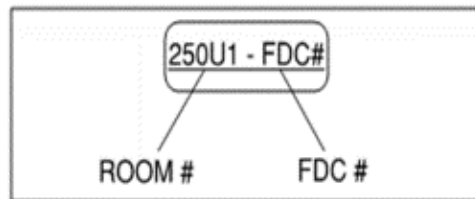
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3. Faceplate Configurations – Figure 3

J. Fiber Distribution Center Patch Panel Labeling:

EXAMPLE	
MDF	IDF
BLDG A –	BLDG B
RM 7	RM 6
IDF 1.5	IDF1.2
BLDG C –	BLDG B
RM 3	RM6

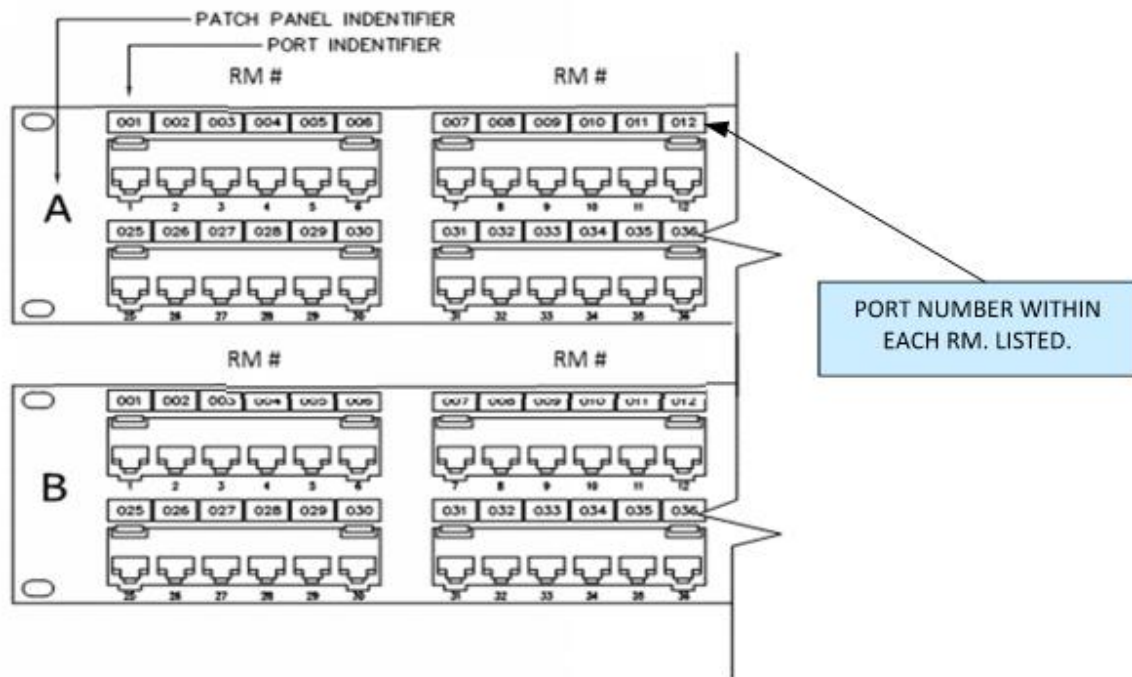


I. Example:

- ROOM # 250U1, Patch Panel #1 = 250U1-FDC1
- ROOM # 250U1, Patch Panel #2 = 250U1-FDC2
- ROOM # 250U1, Patch Panel #3 = 250U1-FDC3

K. UTP Patch Panel Labeling:

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3.11. TESTING

3.11.1. Structured Cabling Testing

- 3.11.1.1. Contractor shall provide a complete and detailed test plan for the telecommunications and networking cabling system, for the UTP and OFN components and accessories. Include procedures for certification, validation, and testing.
- 3.11.1.2. Contractor shall submit factory reel tests for fiber optic cables.
- 3.11.1.3. Contractor shall submit certification of staff to utilize listed testing equipment.
- 3.11.1.4. Contractor shall submit factory test results for patch cords.
- 3.11.1.5. Contractor shall perform structured cabling inspection, verification, and performances tests in accordance with ISO/IEC 14763-3 and ANSI/TIA-568 (most current) standard.
- 3.11.1.6. Permanent link testing shall be performed on all cabling.
- 3.11.1.7. All testing personnel shall be trained on testing equipment tools to assure that complete and accurate testing results are obtained/provided.
- 3.11.1.8. All test equipment shall be calibrated no more than 12 months prior to cable test date. Test equipment shall have the latest software update/release from the test equipment manufacturer.

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- 3.11.1.9. The Installation must be certified to meet the latest available manufacturer system warranty program requirements for an extended warranty of twenty-five (25) years minimum duration. At minimum such warranty shall, at no additional cost the District, provide a system warranty covering the installed Structured Cabling System against defects in workmanship, components and performance.

3.11.2. Inspection

- 3.11.2.1. Visually inspect cabling jacket materials for UL or third-party certification markings.
- 3.11.2.2. Visually inspect plenum rated Category 6a UTP cable and Indoor/Outdoor plenum rated fiber optic cable jacket materials for UL or third-party certification markings.
- 3.11.2.3. Inspect cabling terminations in MDF/IDF rooms and at workstations to confirm color code for tip and ring pin assignments and inspect cabling connections to confirm compliance with TIA 568 (most current) standard.
- 3.11.2.4. Visually confirm Category 6a marking of outlets, cover plates, jacks, and patch panels.

3.11.3. Verification Tests

- 3.11.3.1. Perform 250 MHz for Category 6a near end cross talk (NEXT) and attenuation tests for Category 6a systems installations.
- 3.11.3.2. Perform fiber optic end-to-end attenuation tests using a power meter light source and manufacturer's recommended test procedures. Perform tests in accordance with EIA 526-14, (most current) for horizontal, multimode fiber. Perform verification acceptance tests and factory reel tests.

3.11.4. Performance Tests

3.11.4.1. Category 6a Cable Tests

- 3.11.4.1.1. Perform UTP Permanent link tests in accordance with TIA-568 (most current) standard.

3.11.4.2. Fiber Optic Cable Tests

- 3.11.4.2.1. Perform an optical time domain reflectometer (OTDR) reel test and submit reports to the District before installation of the cable.
- 3.11.4.2.2. Perform a Certified bi-directional attenuation test with a light source and power meter after installation is complete
- 3.11.4.2.3. Perform a bi-directional OTDR test on all fiber optic cables exceeding 90m in addition to the certified attenuation test.

3.11.5. Final Verification Tests

- 3.11.5.1. Perform verification tests for Category 6a and fiber optic cable systems after the complete structured cabling and workstation jacks are installed.
- 3.11.5.2. Provide the District with electronic final test results within 10 days of completion of installation.
- 3.11.5.3. Final test results shall include summary pages for each IDF/MDF as required.

3.12. TELECOMMUNICATIONS

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- 3.12.1. MDF Standard Room
 - 3.12.1.1. MDF Replacement
 - 3.12.1.1.1. On the First Floor
 - 3.12.1.1.2. Adjacent to Electrical Room
 - 3.12.1.2. Rectangle Room with 10 feet x 15 feet minimum
 - 3.12.1.3. Door
 - 3.12.1.3.1. Placement of the door in the middle of the wall
 - 3.12.1.3.2. Door needs to open outward
 - 3.12.1.3.3. 42" door size
 - 3.12.1.3.4. No louvers
 - 3.12.1.3.5. No glass
 - 3.12.1.3.6. Salto Electronic Lock , District Board Approved Standard
 - 3.12.1.4. Proprietary room for Data, Fiber, CATV, Clock and Speaker, Telephone, Security, and UPS Backup
 - 3.12.1.5. Two (2) data racks with 3' of clearance, front and back
 - 3.12.1.5.1. Enough spacing for two (2) additional future racks.
 - 3.12.1.6. Open ceiling, no lid
 - 3.12.1.7. Sealed concrete floor
 - 3.12.1.8. Plywood wrapping, minimum 3 walls
 - 3.12.1.8.1. 8' plywood ¾" fire rated with off-white paint
 - 3.12.1.9. Wrap room in ladder rack with access to racks at both North/South and East/West, creating a cross of ladder rack. Attach to top of data rack.
 - 3.12.1.10. Lighting
 - 3.12.1.10.1. Motion sensor for lights with manual override
 - 3.12.1.10.2. Two (2) emergency lights
 - 3.12.1.10.3. Provide four (4) light bays with height off of racks at 9 feet.
 - 3.12.1.10.4. Provide 40-50 foot candles at 12" AFF (Above Finish Floor) at front and back of racks
 - 3.12.1.10.5. Provide lighting around perimeter of room and not across
 - 3.12.1.11. Two (2) data drops
 - 3.12.1.11.1. One (1) data/phone
 - 3.12.1.11.2. Wall mounted phone
 - 3.12.1.11.3. Mount at 48" AFF
 - 3.12.1.12. Electrical
 - 3.12.1.12.1. 20-amp dedicated circuit
 - 3.12.1.12.2. Double duplex, 20 amp dedicated at 42" AFF for CATV

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- 3.12.1.12.3. Double duplex, 20 amp dedicated at 18" AFF (Above Finish Floor) centrally located on each wall
- 3.12.1.12.4. Run conduit along the bottom of the ladder racking to the top of each rack and mount double duplex 20-amp dedicated box
- 3.12.1.13. Split System Air Conditioning
 - 3.12.1.13.1. Remote Control
 - 3.12.1.13.2. Set points at 68 degrees
 - 3.12.1.13.3. Mounted above door
 - 3.12.1.13.4. Condensate drain line – gravity feed
- 3.12.2. IDF Standard Room
 - 3.12.2.1. Stack above MDF if multi-level building
 - 3.12.2.2. Rectangle Room with 10 feet x 10 feet minimum
 - 3.12.2.3. Door
 - 3.12.2.3.1. Placement of door in the middle of the wall
 - 3.12.2.3.2. Door needs to open outward
 - 3.12.2.3.3. 42" door size
 - 3.12.2.3.4. No louvers
 - 3.12.2.3.5. No glass
 - 3.12.2.3.6. Salto Electronic Lock, District Board Approved Standard
 - 3.12.2.4. Proprietary room for Data, Fiber, CATV, Clock and Speaker, Telephone, Security and UPS Backup
 - 3.12.2.5. Two (2) data racks with 3 feet of clearance, front and back
 - 3.12.2.6. Enough spacing for two (2) additional future racks
 - 3.12.2.7. Open ceiling, no lid
 - 3.12.2.8. Sealed concrete floor
 - 3.12.2.9. Plywood wrapping, minimum 3 walls
 - 3.12.2.9.1. 8-foot plywood ¾" fire rated with off-white paint
 - 3.12.2.10. Ladder rack to the top of the rack from the conduit stub UPS.
 - 3.12.2.11. Lighting
 - 3.12.2.11.1. Motion sensor for lights with manual override
 - 3.12.2.11.2. Two (2) emergency lights
 - 3.12.2.11.3. Provide 2 light bays with height off of racks at 9 feet.
 - 3.12.2.11.4. Provide 40-50 foot candle at 12" AFF
 - 3.12.2.11.5. Provide lighting around the perimeter of the room, not across
 - 3.12.2.12. Electrical
 - 3.12.2.12.1. 20-amp dedicated circuit

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3.12.2.12.2. Double duplex, 20-amp dedicated at 42" AFF

3.12.2.12.3. Double duplex, 20-amp dedicated at 18" AFF, centrally located on each wall

3.12.2.12.4. Run conduit along bottom of ladder racking to top of each rack and mount double duplex 20-amp dedicated circuit box

3.12.2.13. Split System Air Conditioning

3.12.2.13.1. Remote Control

3.12.2.13.2. Set points at 68 degrees

3.12.2.13.3. Mounted above door

3.12.2.13.4. Condensate drain line – gravity feed

END OF SECTION 27 10 00

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27 20 00

DATA COMMUNICATIONS ACTIVE INFRASTRUCTURE

PART 1 – GENERAL

1.01 SUMMARY

- A. This section describes the data communications network infrastructure including electronics and software needed to support Local Area Networks and network management.
- B. Contractor and Integrator shall verify all equipment models with the District prior to purchase.
- C. Contractor and Integrator shall be responsible for coordinating and providing Network Design to the District for review and approval.
- D. Products Installed Under this Section: Only new equipment and material, produced by manufacturers that are recognized nationally by the telecommunications industry and approved by Underwriters Laboratory shall be used as specified in this Section or on the Drawings.
 - 1. All mounting hardware
 - 2. All mounting brackets
 - 3. All power cords
- E. Related Sections
 - 1. Division 01
 - 2. 23 09 00: Instrumentation Controls for HVAC
 - 3. 26 05 00: Common Work Results for Electrical
 - 4. 27 10 00: Structured Cabling
 - 5. 27 51 26: Assistive Listening System
 - 6. 28 16 00: Intrusion Detection System
 - 7. 28 23 00: Digital Video Surveillance System

1.02 REFERENCES

- A. NEMA – National Electrical Manufacturer’s Association
- B. ANSI – American National Standards Institute
- C. NEC – National Electric Code
- D. RSEF – Relevant State Electrical and Fire Codes
- E. IEEE – Institute of Electrical and Electronic Engineers
- F. UL – Underwriters Laboratories, Inc.
- G. ANSI/EIA/TIA – 568-C.0, Generic Telecommunications Cabling for Customer Premises
- H. ANSI/EIA/TIA – 568-C.1, Commercial Building Telecommunications Cabling Standard
- I. ANSI/EIA/TIA – 568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard
- J. ANSI/TIA – 568-C.2-1 Transmission Performance Category 6 Cabling Specifications for 4-Pair 100 Ω Category 6 Cabling, provided they meet accuracy requirements for level III field testers; Category 6

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- K. ANSI/TIA – 568-C.3, Optical Fiber Cabling Components Standard
- L. ANSI/TIA – 569A Commercial Building Standard for Telecommunications Pathways and Spaces
- M. ANSI/EIA/TIA – 606 The Administration Standard for the Telecommunications Pathways and Spaces
- N. ANSI/EIA/TIA – 607 Commercial Building Grounding and Bonding Requirements for Telecommunications
- O. ANSI/EIA/TIA – 598 Color Coding of Optical Fiber Cables
- P. EIA/TIATSB – 67 Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems
- Q. BICSI – Building Industry Consulting Service International publications:
 - 1. Telecommunications Distribution Methods Manual
 - 2. LAN and Internetworking Design Manual
 - 3. Telecommunications Cabling Installation Manual
 - 4. Customer Owned Outside Plant Design Manual
 - 5. Manufacturer’s recommendations and installation guidelines
- R. All cabling shall comply with all appropriate requirements of NEC Articles 770 and 800 and shall comply with the State Fire Codes as interpreted by the State Fire Marshall’s Department.
- S. All publications referred to in this document shall be the latest publicized edition.

1.03 DEFINITIONS

- A. Contractor – The entity responsible for performing or overseeing the installation and configuration of the system.
- B. District – Long Beach Unified School District
- C. District Approved Equal – A product that the Contractor submitted as equal to or greater than the product specified, which subsequently received District approval for use on the intended project. Refer to Division 01s for additional information
- D. District Standard – a design or brand selected by the District Board as the acceptable product.
- E. District Technology Representative – An individual from the District’s Facilities Technology Group. They should possess an official @lbschools.net email address.
- F. District Representative – An authorized individual representing the District, for example a project manager or construction manager.
- G. Hard Lid – A fixed ceiling where the ceiling material is affixed directly to the underside of roof framing.
- H. Integrator – The entity performing the physical installation and configuration of the system, who may be a sub-contractor of the Contractor.
- I. Owner – The District’s, Technology Information Services Branch (TISB), who will oversee the system after turnover.
- J. Prime Period of Maintenance (PPM) - regular hours of operation the Contractor is to provide for maintenance services.
- K. WAP(s) - Wireless Access Point(s)

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- L. Core Switch – The central switch for a site. This switch feeds all IDF switches and is located at the MDF. It also serves as the router for the site.
- M. IDF – Intermediate Distribution Frame – Location where access layer switches reside.
- N. MDF – Main Distribution Frame – Location where the Core switch resides, often also has access layer switches as well.

1.04 SUBMITTALS

A. Product Data

1. Provide a list of complete current part numbers and confirm with District during submittal phase.
2. Contractor and Integrator shall verify all equipment models with the District prior to purchase.
3. Refer to sections 01 11 00 Summary of Work and 01 33 00 Submittals for full details.
4. If additional equipment is required to meet performance specifications of the system the Contractor shall provide the equipment with District written approval prior to installation.

B. Certificates

1. Contractor shall hold and maintain, through the completion, commissioning, closeout, and warranty period of the project, the following certification for the Data Communications:
 - a. Cisco Certified Partner
 - b. Advanced Wireless LAN Specialist with Cisco Certified Network Associate (CCNA).
2. Contractor shall hold and maintain, through the completion, commissioning, closeout, and warranty period of the project, the following certification for the Wireless Equipment:
 - a. Select Tier or greater partnership level.
 - b. JNCIA-MistAI - Juniper Networks Certified Internet Associate.
 - c. AirMagnet WiFi Pro or AirMagnet Survey Pro or District approved equal.
3. Contractor shall provide proof of certification to the District during bid time.

C. Qualifications

1. The Installing Contractor shall provide proof of certification to the District during bid time. The installing Contractor must be certified with the manufacturer for at least twelve (12) months prior to the bid.
2. Contractor shall assign a competent person as project manager who has demonstrated the ability to supervise a project of similar size and scope. Submit a resume of the proposed Project Manager for the District's review and acceptance. The Project Manager must attend meetings as required.
3. Contractor shall provide documentation to the District to demonstrate that it has been in the telecommunications contracting business for a minimum of five (5) years under the same name and is located within a four (4) hour response time of the District.

D. Refer to Section 01 33 00 for additional requirements.

1.05 CLOSEOUT SUBMITTALS

- A. The Contractor shall provide published escalation and priority handling procedures. This shall include the names and phone numbers, in organizational chart format, of the technicians and management (up to the CEO of the company) responsible for supporting the District.
- B. The Contractor shall describe its policies and plans to assist the District in the event of a catastrophic disaster to the facilities mentioned in this section.
- C. Contractor shall provide a report noting the following:

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1. Initial set-up and configuration.
2. Configuration management for additions and changes. (Including emergency board replacement.)
3. Problem solving and resolution procedures

1.06 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers thoroughly trained and experienced on the necessary crafts and completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials (except bulk materials) in manufacturer's unopened containers fully identified with manufacturer's name, trade name, type, class, grade, size and color.
- B. Store materials in unopened containers. Store off ground and under cover, protected from damage.

1.08 WARRANTY

- A. MDF core switch electronics: LAN electronics and associated software shall be warranted for one (1) year with full-service materials and labor. Contractor shall be available 24-hour/7-day-per-week PPM for on-site service to correct defects in installation, workmanship, product failure, or material without charge for labor, materials or parts.
- B. IDF switch locations: LAN electronics and associated software shall be warranted for one (1) year with full service materials and labor. Contractor shall be available Monday through Friday 8am-5pm PPM for on-site service to correct defects in installation, workmanship, product failure, or material without charge for labor, materials or parts.
- C. The Contractor shall provide one (1) year Smartnet warranty on all Cisco equipment and software provided under this contract. In addition, the Contractor shall provide a manufacturer limited lifetime hardware and software warranty on all products supplied. The Contractor will warrant the system to perform in the intended use as indicated in this section.
- D. All major component failures must be replaced within a four-hour period. A major component shall be considered any hub or switch component that affects fifty or more user devices.
- E. The Contractor must provide a four-hour response time to problem calls during the Prime Period of Maintenance (PPM). For problems reported outside of PPM, response time can occur no later than the beginning of PPM for the next day. Response time is defined as on-site presence of authorized maintenance personnel equipped with appropriate spare parts and diagnostic tools.
- F. Once work has begun on repair of a critical problem, a technician shall remain on-site until the problem has been repaired. The Contractor shall be allowed to change technicians at shift changes, however, the first technician shall not leave the site until the second has arrived and has been briefed on the problem.
- G. The Contractor shall provide the District with the manufacturer toll-free hotline and support center to assist the District personnel in the installation, tuning, maintenance and updating of the systems hardware and software.
- H. During the warranty period, the Contractor shall maintain an inventory of critical spare parts that shall be available locally, in a location approved by the District, to ensure the repair response times required in this section.
- I. If parts are required to fix a critical problem that is not available locally, they shall be shipped by the fastest possible means at no cost to the District.
- J. During the warranty period, the Contractor shall keep on-site detailed maintenance and repair records of all calls made to the facility.

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PART 2 – PRODUCTS

2.01 LAN ELECTRONICS

- A. Contractor and Integrator shall verify all equipment models with the District prior to purchase.
- B. All Cisco equipment is to be new and certified by Cisco for SmartNet. No manufacturer substitutions allowed.
- C. No refurbished, used, after-market or gray-market components will be accepted.
- D. Material must be rack mountable in the equipment racks as specified in Section 27 10 00 Structured Cabling.
- E. The system must be able to be remotely managed by existing District Cisco Prime, DNA or other approved management system at the discretion of the District.
- F. The system is required to operate 24 hours/day, 7 days/week. At a minimum, the system is required to have an uptime of 99 percent for any single switch component during the hours of 7:00 a.m. to 7:00 p.m. (and 98 percent uptime when calculated over a 24-hour day).
- G. **MDF Cisco 9500X Series “Core” Switch**
 - 1. Redundant power supplies are required for each of the core switches. For 24 port switches: Part number (C9K-PWR-650WAC-R/2) for larger High school switches: 9500x Catalyst 9500X 950 W AC Config 4 Power Supply front to back cooling. PWR-C4-950WAC-R or PWR-C4-950WAC-R/2.
 - A. U.S. Power Cord, 250 VAC 13 A NEMA 6-15 Plug, North America AC Type A Power Cable. CAB-TA-NA
 - 2. For Elementary, Middle and small high schools with less than 18 fiber connections: r 9500X core switch, part number C9500-24YAC-EDU.
 - A. Provide Cisco Catalyst 9500 DNA Advantage 3 Year License: C9500-DNA-L-A-3Y License for Enterprise services, must support BGP, Advanced IP Routing and QOS.
 - B. Cisco CAB-9K12A-NA U.S. Power Cord, 125VAC 13A NEMA 5-15 Plug, 8.2-Ft., North America.
 - 3. For large high schools (or sites with more than 18 fiber connections): 9500X core switch, part number C9500-40X-EDU
 - A. SNTC-8X5XNBD Catalyst 89500 40-port 10G, K12: CON-SNT-C9500-4X.
 - B. C9500 Network Advantage, high-density license K12: C9500-NW-A-EDU.
 - C. CAT9500 Universal Image: S9500UK9-166.
 - 4. Contractor to verify fiber run distance and select SFP to accommodate 10G connectivity. Use 10GBASE-SR SFP Module for OM3, OM4 and where it will support 10G. Part number SFP-10G-SR. For older fiber use 10GBASE-LRM SFP Module. Part number SFP-10G-LRM. Fiber-Optic cable in support of data transmission between MDF and IDF, at or over 400 meters must be installed with Singlemode cable and appropriate long haul transceivers.
 - 5. License for Enterprise services, must support BGP, Advanced IP Routing and QOS.
 - 6. The Contractor and Integrator shall verify all equipment models, components and correct amount of components with the District prior to purchase.

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- H. I. IDF Switches
1. Redundant power is required for each switch. For stacked switches power redundancy may be achieved through the stacking cables: STACK-T1-50CM and CAB-SPWR-150CM. For non-stacked switches (i.e. 1 switch IDFs) use Catalyst 9300 1100W AC Power Supply, part number PWR-C1-1100WAC-P/2
 - A. A maximum of four switches can be power stacked in a configuration
 2. IDF's that contain more than six (6) switches in a cabinet shall be broken down into two (2) smaller cabinets. This does not apply to large IDFs using full length floor standing racks. Large IDFs with more than six (6) switches will create two distinct switch stacks. One switch stack will consist of the first Four (4) switches and the other stack shall be the remainder. Stacks are not able to exceed 4 switches per stack due to stacking cable limitations. Provide additional SFP interconnect cables as required.
 3. 48 port access layer switch is as follows:
 - a. 48 x 5Gbps Multigigabit ports (5G/2.5G/1G/100M), Modular Uplinks, UPOE, K12, part number C9300-48UN-EDub. AC Power Cord for Catalyst 9300 (North America), part number CAB-TA-NA
 - b. AC Power Cord for Catalyst 9300 (North America), part number CAB-3KX-AC.
 - c. Catalyst 9300 10GE Network, Module option PID, part number C9300-NM-8X. A minimum of one network modules is required in an IDF. Stand alone, non-stacked switches will all require a network module.
 - d. Catalyst 9300 1100W AC Power Supply, part number PWR-C1-1100WAC-P/2
 - e. Catalyst 9300 Power Supply Blank, part number PWR-C1-Blank=
 - f. Contractor to verify fiber run distance and select SFP to accommodate 10G connectivity. Use 10GBASE-SR SFP Module for OM3, OM4 and where it will support 10G. Part number SFP-10G-SR. For older fiber use 10GBASE-LRM SFP Module. Part number SFP-10G-LRM. Fiber-Optic cable in support of data transmission between MDF and IDF, at or over 400 meters must be installed with Singlemode cable and appropriate long haul transceivers.
 - g. The Contractor and Integrator shall verify all equipment models, components and correct amount of components with the District prior to purchase.
 - h. All switches that are to be stacked shall be purchased with data stack cables. Any unused stack cables shall be turned over to District at project close-out. Part number: STACK-T1-50CM or STACK-T1-1M. **Contractor is advised that larger stacks of switches (3+) will require the longer stack cables. Contractor shall order accordingly.** i. All switches that are to be stacked shall also be purchased with power stack cables. Any unused stack cables shall be turned over to District at project close-out. Part number: CAB-SPWR-30CM or CAB-SPWR-150CM. **Contractor is advised that larger stacks of switches (3+) will require the longer stack cables. Contractor shall order accordingly.**
- J. Provide a UPS system at MDF per the following:
1. High school MDF – Tripp Lite 3000VA, part number SU3000LCD2UHV, with UPS – shall be rack mountable with management module, and external battery pack, part number BP72V18-US.

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2. Elementary and middle school MDF - Tripp Lite SmartOnline 2200VA, part number SU2200RTXLCD2U, with UPS shall be rack mountable with management module, and external battery pack, part number BP486V60RT3U.
3. All UPS must be configured with Tripp Lite SNMP Management card for remote monitoring, part number WEBCARDLX.
4. Tripp-Lite Enviro-sense Module, part number ENVIROSENSE.
5. The Contractor and Integrator shall verify all equipment models, components and correct amount of components for the MDF with the District prior to purchase
6. Contractor shall verify the number of Uninterruptible Power Supply and number of Battery Packs needed to acquire the Baseline Run Time for all the switches. Baseline Run Time requirement is to be coordinated with the District prior to purchase.

K. PDU Specifications:

1. Objectives:

- a. Network-grade surge protection with Lifetime Insurance protection for connected devices*.
- b. Traditional 1U or 2U height for standard EIA 19 inch racks.
- c. Resettable circuit breaker.
- d. Outward facing power ON/OFF switch with cover plate to accidental tripping protection.
- e. Min. 12 AC outlets available for equipment.
- f. Min. 10 foot input power cord length.
- g. 12, 20 and 30 amp installation solutions depending on cabinet density and supply power configurations.

*Lifetime Insurance Protection requires proactive registration of PDU and connected components.

2. 120vAC 15 AMP Installations – 1-3 switches (Replaces SU1000RTXLCD2U or SU1500RTXLCD2U)

ISOBAR12ULTRA PDU – Tripp-Lite

- a. Input: QTY. 1 NEMA 5-15 120V AC power cord
- b. Outlets: QTY. 2 front 5-15R receptacle
- c. Outlets: QTY. 10 rear NEMA 5-15R receptacles

3. 120vAV 20 AMP Installation – 1-3 switches (Replaces SU2200RTXLCD2U)

ISOBAR20ULTRA PDU – Tripp-Lite

- a. Input: QTY. 1 NEMA 5-20P 120V AC power cord
- b. Outlets: QTY. 2 front NEMA 5-15R receptacles
- c. Outlets: QTY. 10 rear NEMA 5-20R receptacles

4. 120vAC 30 AMP Installations – 4-6 switches (replaces SU3000RTXLCD2U)

PDUMNH30 Monitored PDU - Tripp-Lite

- a. Input: QTY. 1 NEMA 5-30P 120V AC power cord
- b. Outlets: QTY. 16 rear NEMA 5-20R receptacles
- c. 120V AC single phase
- d. Built In LX platform Network Management Interface

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- e. Digital front panel Display with load status
- f. *No Surge protection available

5. 208/240vAC 30 AMP installation – 4-6 switches with C type receptacles

PDUMNH30V Monitored PDU – Tripp-Lite

- a. Input: QTY. 1 NEMA L6-30P AC power cord
- b. Outlets: QTY. 12 rear C13 receptacles
- c. Outlets: QTY. 4 rear C19 receptacles
- d. 240V AC single phase
- e. Built In LX platform Network Management Interface
- f. Digital front panel Display with load status
- g. *No Surge protection available

2.02 RACK ELEVATION EXAMPLES

Rack elevation examples are based on District's specification stated in section 2. Below, are examples of small to medium IDF's racks and MDF racks.

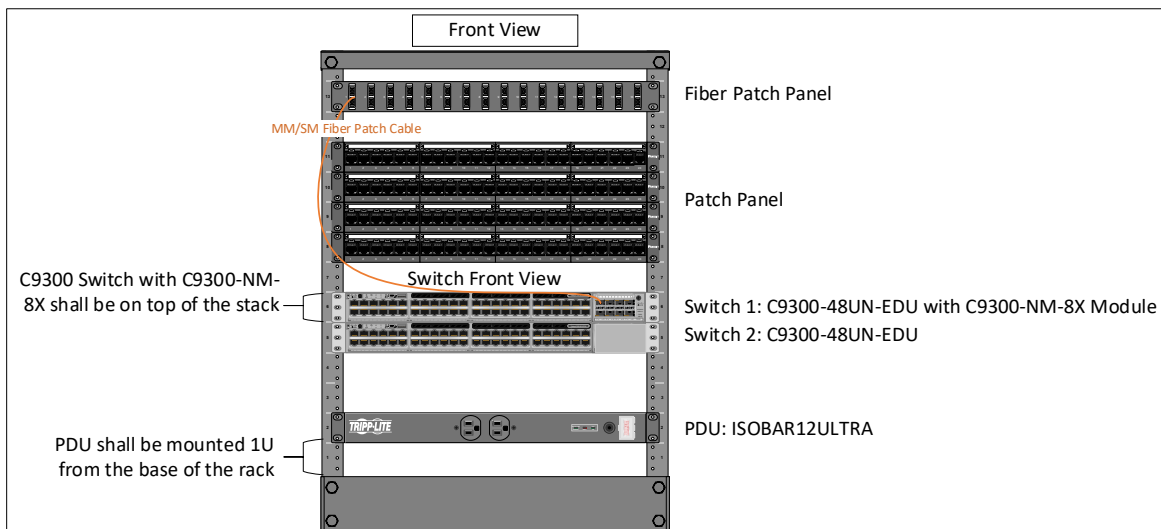


Figure 1: Small IDF Rack Elevation – Front View

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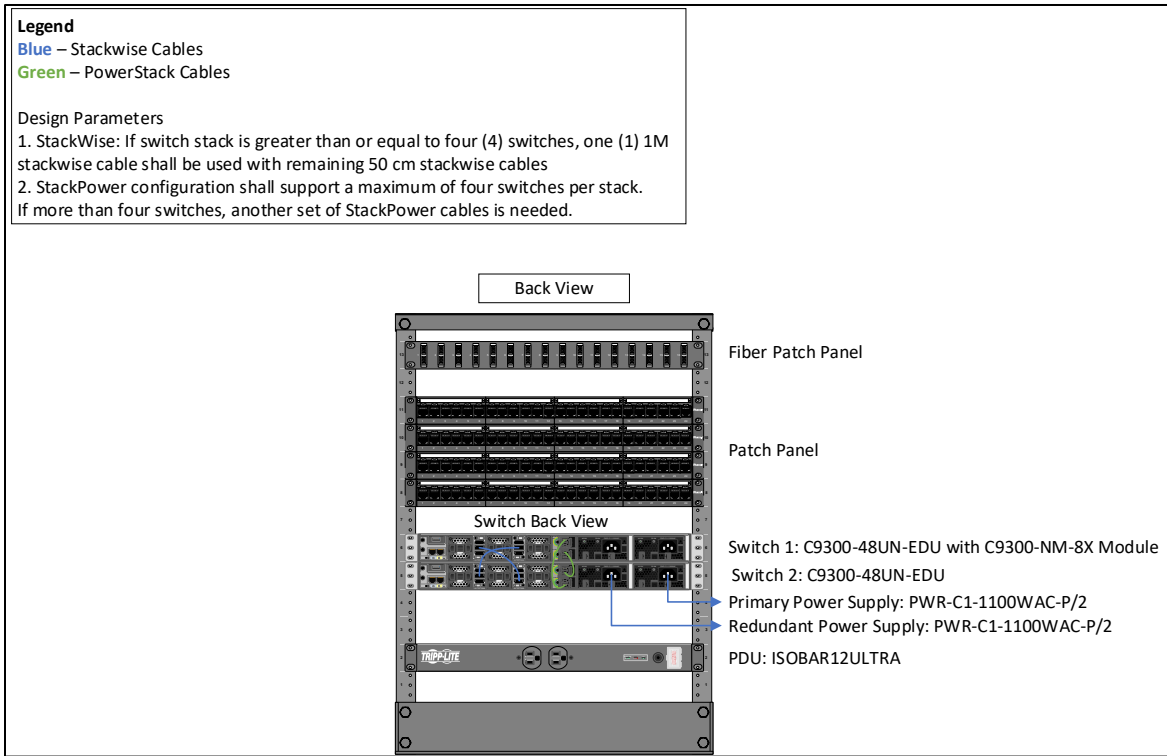


Figure 2: Small IDF Rack Elevation – Front View

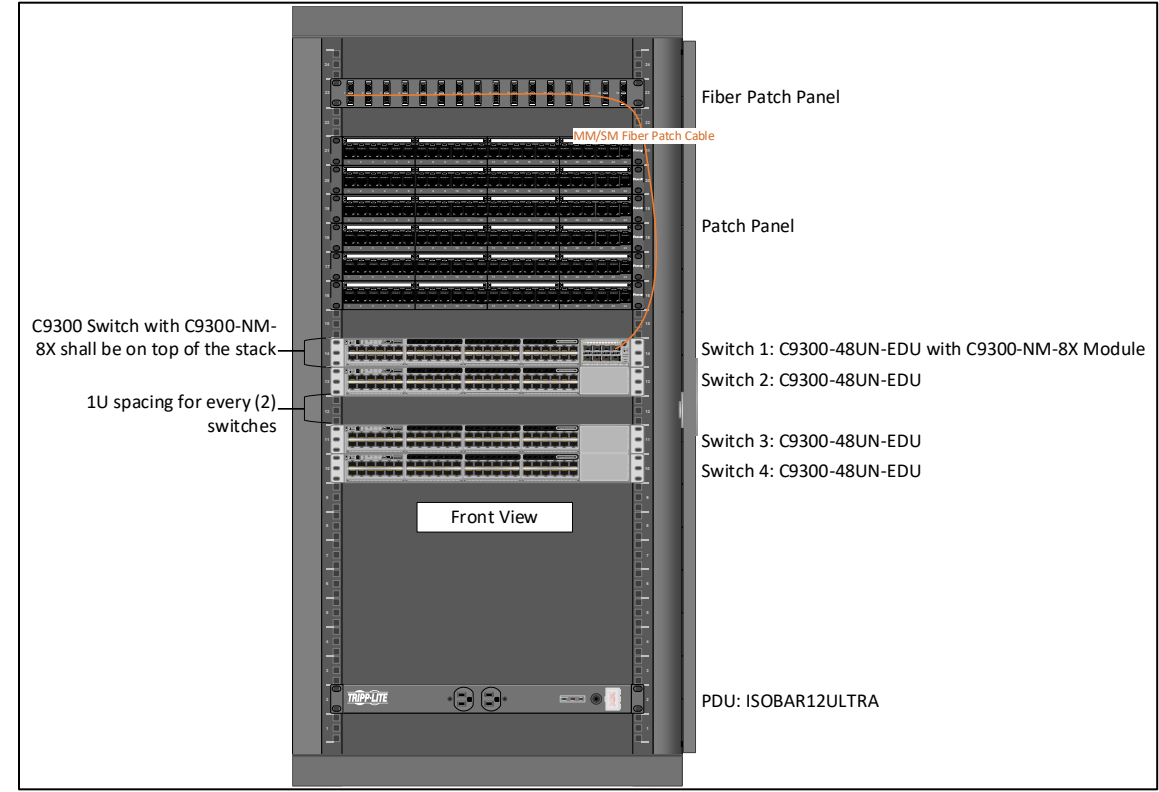


Figure 3: Medium IDF Rack Elevation – Front View

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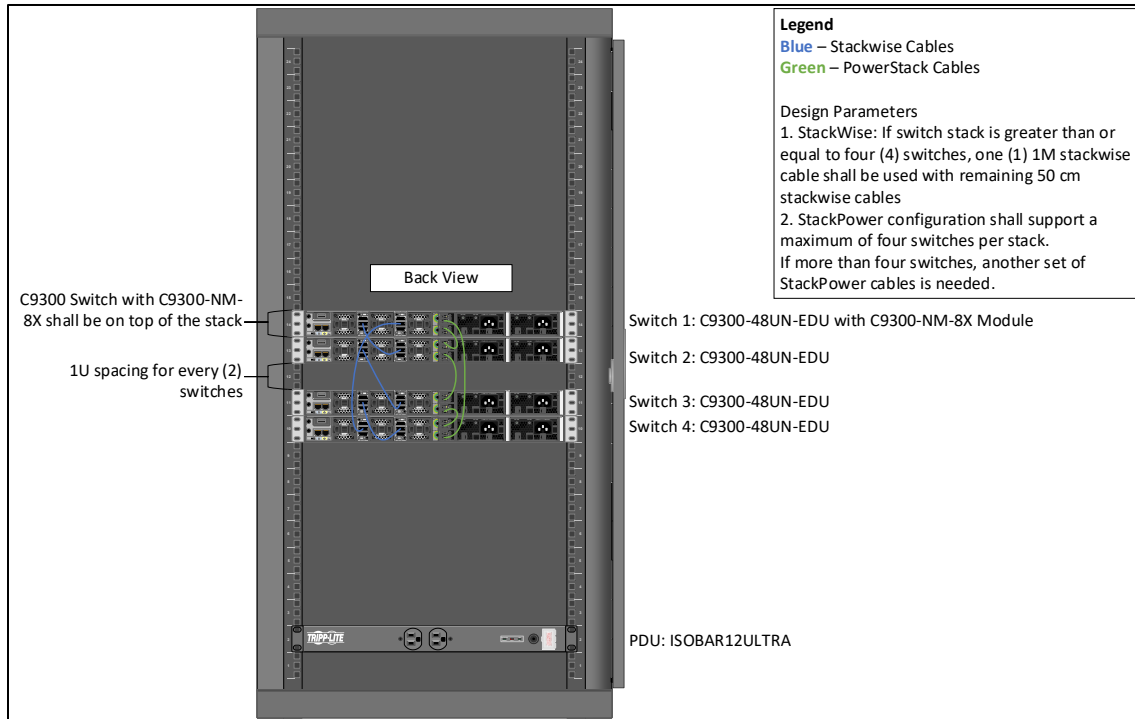


Figure 4: Medium IDF Rack Elevation – Back View

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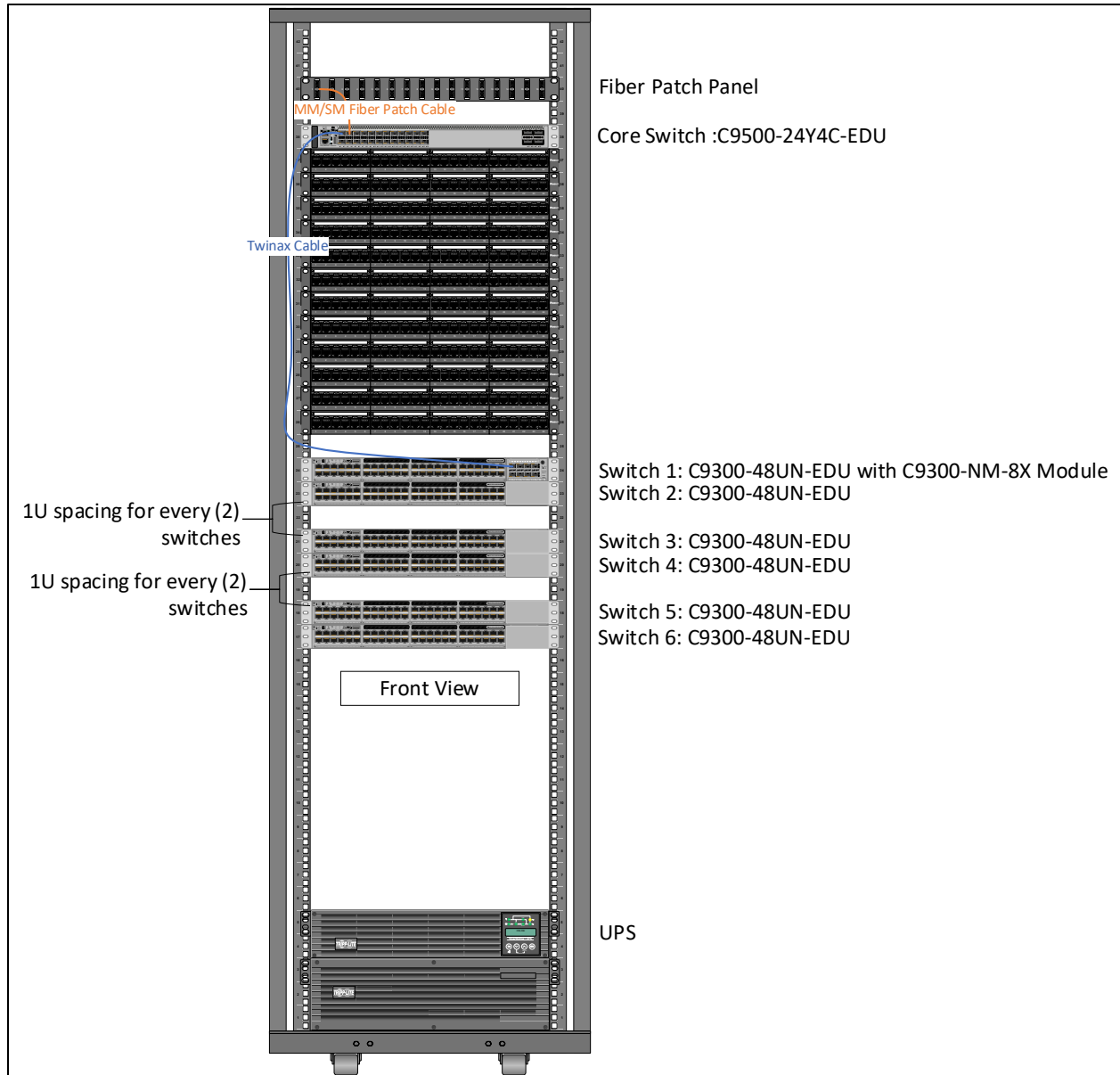


Figure 5: MDF Rack Elevation – Front View

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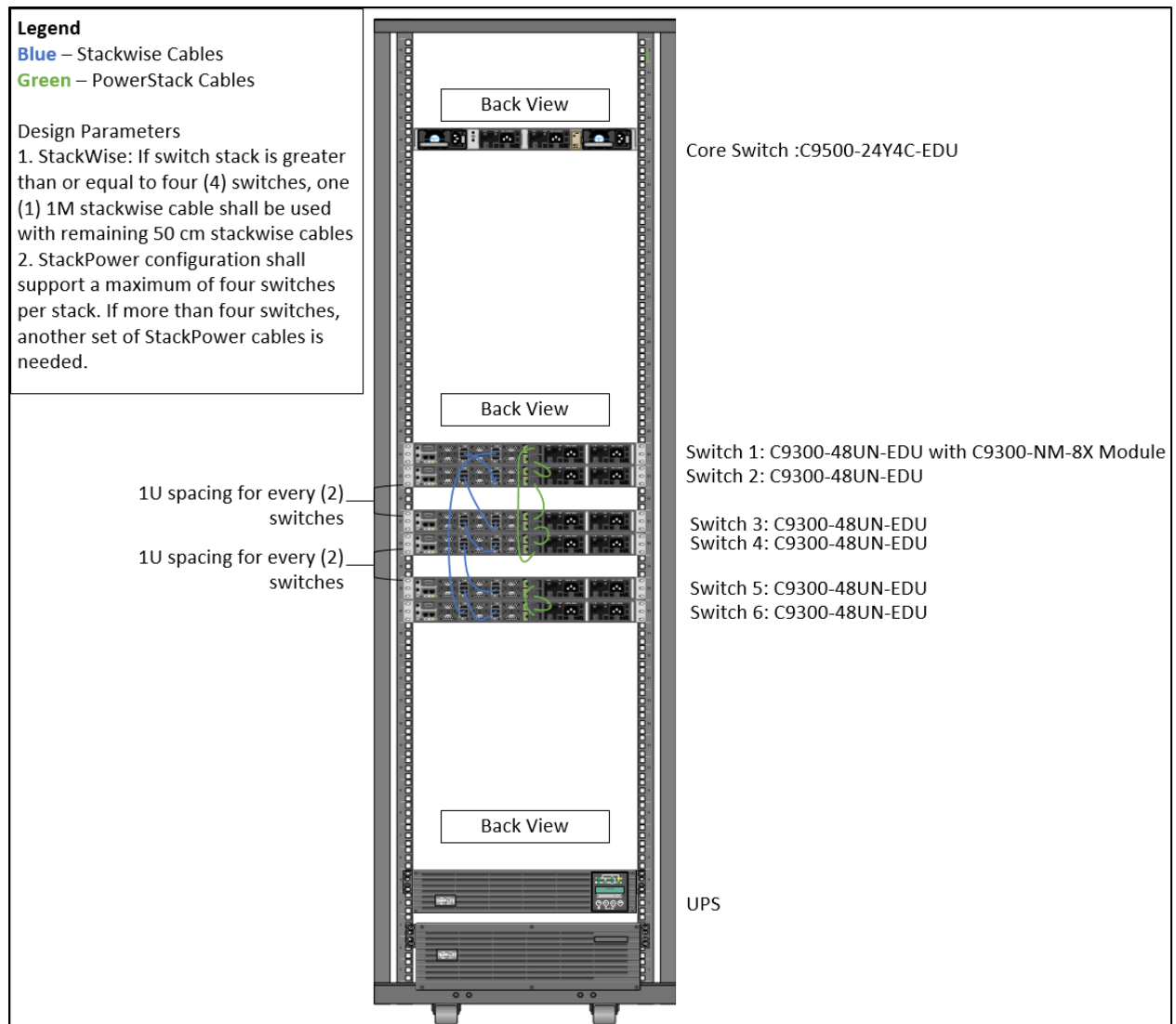


Figure 6: MDF Rack Elevation – Back View

2.03 WIRELESS ACCESS POINTS AND ACCESSORIES

- A. 802.11ax (Wi-Fi 6), including support for OFDMA, 1024-QAM, MU-MIMO, Target Wake Time (TWT), Spatial Frequency Reuse (BSS Coloring). Backwards compatibility with 802.11a/b/g/n/ac
- B. Model: Juniper Mist AP43 for interior and AP43e for exterior/antenna installations.
- C. Interior part number Juniper Mist AP43. Bundle with 5 year Licensing: Ordering number: B-AP43-2S-5Y-E
- D. Exterior Part number Juniper Mist AP43E
 - a. Exterior Antenna: 2.4/5 GHZ 4/2 DBI 6 ELEMENT INDOOR/OUTDOOR 90×90 PATCH ANTENNA WITH RPSMA - **Part Number: ATS-OHDP-245-42-6RPSP-36**

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- E. For wireless installations requiring additional protection (i.e. outdoors or in gyms) use the following protective enclosure: **12X10X6 POLYCARBONATE ENCLOSURE WITH CLEAR DOOR, KEY LOCK & 6 RPSMA HOLES Part Number: ATS-12106P-C-K-6S-CG-UBPTB**
- F.
- G. Juniper Universal AP bracket as required..Part number APBR-U (Note AP package typically comes with 1 bracket) This bracket does not require additional hardware to mount to most ceiling types.
- H. .
- I. Brand shall be Juniper for compatibility with existing dashboard software, substitutions are not acceptable.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

- A. Property damage caused by the Contractor during the installation and testing process shall be replaced at no cost to the District.
- B. The Contractor shall be responsible for all mounting kits and brackets for the LAN electronics and Wireless equipment.
- C. The Contractor shall be responsible for providing and patching ALL fiber and copper data cables into LAN electronics and Wireless equipment per the specifications.

3.03 LOCATIONS

- A. Coordinate with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by LBUSD representative, anchoring all components firmly into position for long life under hard use.

3.04 GENERAL INSTALLATION REQUIREMENTS

- A. The Contractor shall provide a turnkey solution. Turnkey installation is defined as having all networking components including cabling, LAN electronics, and LAN servers working as individual components as well as a homogenous system.
- 3. The Contractor will coordinate installation schedules with the District Representative so as to minimize the impact on day-to-day operation for the campus.

3.05 LAN ELECTRONICS INSTALLATION

- A. The District will provide IP addresses and switch port numbers as necessary to the Contractor. The Contractor shall test and confirm correct port placement, functionality for the appropriate VLAN and overall system functionality.

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- B. The Target System Configuration shall be a collapsed backbone topology. A high capacity 10 Gigabit Ethernet (10GBaseSR/LR) switch located in the MDF of each school site shall be the focal point of the backbone. WAN connectivity is via MetroEthernet Transparent LAN Service.
- C. The switch will connect client workstations with servers and applications throughout the school campus as well as to applications available through the WAN, and shall have IP base routing capabilities with secure shell console management.
- D. The Contractor shall configure each switch with the appropriate District provided TCP/IP address and District configuration. The console and management software is currently installed at LBUSD offices. Coordinate with District Representative for TCP/IP address and configuration.
- E. The Contractor shall follow the District's naming convention for switches.
- F. The Contractor shall complete IP sheet assignment tracking of address and host name assignments for any new infrastructure placed on the network.
- G. The Contractor shall include switch port assignments on to the appropriate VLAN for all new installed infrastructures, including replacement switches and WAPs.
- H. The Contractor shall include topology of switches/stacks in each MDF/IDF.
- I. The Contractor shall show VLAN Trunking Protocol
- J. The Contractor shall provide "runs and shows" for each switch. Runs and shows in this case refers to the show run command on Cisco switches.
- K. All core switches shall be configured with all necessary control and management modules for complete and operational system.
- L. The MDF switch shall be configured with redundant load sharing power supplies.
- M. The MDF switch shall be supported by an in-line Tripp-Lite UPS and appropriate extended run battery(s) capable of supplying 60 minutes of power to the MDF switch at full load.
- N. The UPS shall also be equipped with an SNMP agent such as a Tripp-Lite SNMP Web Card part number WEBCARDLX so that the management station is notified if the UPS is operating in battery mode.
- O. MDF UPS power supply shall be capable of interfacing with the core switch so MDF is aware of when it is using battery backup.
- P. Access layer Ethernet (100BaseTX/1000BaseTX/10GBaseTX) PoE Switches are to be located in each closet supporting interfaces.
- Q. Unshielded Category 6 Twisted Pair (UTP) wiring will connect access layer switches to the station devices (PC's, printers, etc.) All 1000BaseTX/10GBaseTX interfaces are to be 8-pin modular (RJ-45) type.
- R. All interfaces to the core switch shall be fiber optic
- S. Each MDF UPS will include the appropriate extended run battery(s) capable of supplying 60 minutes of power.
- T. For new installations Singlemode fiber optic cable (laser optimized OS2) shall connect the IDF LAN Electronics to the high capacity Ethernet switch. For existing conditions, verify fiber types and connectors in field.
- U. The goal of the network is to allow any workstation (PC) access to any application that the user is authorized for on the LAN or WAN.
- V. One Pluggable SFP interface is required for each stack of Catalyst 9300 switches.
- W. Provide a PDU at each IDF installed at the bottom, leaving one rack unit open.
- X. All switch components must be manageable by the existing District Cisco DNA centralized system management console.

3.06 FILE STORAGE SERVERS INSTALLATION

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- A. Prior to ordering and installing files storage server, Contractor shall coordinate with the District, the specific configuration requirements of file storage server.
- B. Due to the many versions and releases of file storage servers, Contractor shall not purchase server more than 90 days prior to installation.
- C. The Contractor shall not purchase or install file storage server without written approval from the District.

3.07 WIRELESS INSTALLATION

- A. Wireless controllers are existing and cloud based. All new wireless must be tied into existing deployment.
- B. Follow best practices from Juniper for installation and configuration of wireless.
- C. No power injectors allowed unless otherwise noted.
- D. Configure new wireless and BYOD VLANs. Verify DHCP setup with District IT personnel
- E. Install new WAPs per drawings. Label WAPs with MAC address and a plastic label that is printed large enough to be visible from floor level. Plug in only eth0. Do not use other rj45 ports.
- F. WAP configuration: Coordinate with District IT personnel for installer account access. Log into mist application or webUI to add new WAPs. Contractor may scan QR codes on WAP boxes to add, or use MAC addresses.
- G. Requires DHCP on a specific VLAN, each switch port attached to a WAP must be configured for trunking and a specific VLAN native. Verify specifics by looking at existing configuration port settings or request from District Representative. Access points do not auto configure on switches.
- H. Configure WAPs on Mist app or Mist web dashboard, including renaming them, configuring orientation and placing on maps. Provide and upload new maps as necessary for new buildings.
- I. Configure SSIDs. Contractor is advised to look at existing SSIDs at other locations or request confirmation from District Representative what SSIDs are needed. Note: There may be hidden non-broadcast SSIDs. For new sites Contractor will need to build out a new site template. Coordinate with District IT as necessary. District IT is a consult only, Contractor to ultimately identify and perform all required configuration.
- J. Test Wireless access SSID connectivity.
- K. Verify in dashboard that all new devices are online and healthy. Provide final spreadsheet indicating install locations (device names), serial numbers, mac addresses, connectivity status (should all be connected) and warranty information.

3.08 ACCEPTANCE TESTING

- A. All LAN electronics specified in this document must meet manufacturer's standard tests. Testing must include the ability to successfully "ping" from one device to another and to and from PC end stations and servers. PC's must be able to connect to their appropriate servers.
- B. Device configurations must be reviewed and approved by the District before deployment in production environment to allow for changes and acceptance.
- C. Predictive surveys are not acceptable. Physical surveys are required.
- D. The Contractor shall prepare detailed coverage heat maps, after the installation of the WAP's, using AirMagnet Wi-Fi Pro, AirMagnet Survey Pro or equal approved by the District. Predictive site surveys are not acceptable such as utilizing Cisco Prime software. Provide current certifications for the site surveyor for AirMagnet or District approved equal. Provide a copy of the physical survey to District Technology Representative prior to installation of Wireless Access Points). Heat maps shall identify:

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1. Access point quantity
2. Access point locations (room & building)
3. Access point protocol 802.11 a/b/g/n/ac/ax
4. Access point channel and signal strength
5. Common access point configuration
6. Seamless subnet roaming
7. Non 802.11 interference in 2.4GHz and 5GHz bands
8. Special antenna
9. Physical end environmental requirements for access point placement
10. Upgrades to existing access points (including hardware and/or software)

3.09 PROJECT RECORD DOCUMENTATION

- A. The Contractor shall submit a daily report to the District Project Team. This report should contain the following information:
 1. Summary of work completed for the week concluded. Including personnel onsite and hours of work.
 2. Summary of work anticipated for the following week.
 3. Any action items requested of the District personnel.
 4. Any deviations from the implementation schedule.
- B. Prepare and submit copies of configurations, as-builts and logical network diagrams updated to reflect the new work completed **for each campus project** (i.e. site plans, cable, pathways, MDF/IDF cabinet elevations, equipment configuration spreadsheets, etc.).
- C. These documents must be delivered to the District upon completion of work and before Final Inspection.

End of Section 27 20 00

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SECTION 27 51 26 ASSISTIVE LISTENING SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Work included:
 - 1. Provide assisted listening system as described herein and on drawings.
 - 2. Provide FM/RF Assistive Listening System with remote-mounted vertical antenna located behind bleachers at centerline, mounted minimum 10-15 ft above grade, providing full coverage of all seating areas.
 - 3. Provide and install a small NEMA enclosure behind bleachers with transmitter inside.
 - 4. Contractor to walk with receiver in order to ensure good coverage prior to installing the transmitter.
 - 5. indicate the CBC requirements as follows:

Permanent installed assistive listening system (ALS) is required for this project, complying with the following CBC accessibility requirements:

- 1. Assistive listening systems shall be provided in accordance with Section 11B-219 and shall comply with Section 11B-706.
 - 2. The minimum number of receivers provided shall be equal to 4 percent of the total number of seats, but in no case less than two. Twenty-five percent minimum number of receivers provided, but no fewer than two, shall be hearing-aid compatible in accordance with Section 11B-706.3.
 - 3. Receivers for use with an ALS shall include a 1/8 inch (3.2 mm) standard mono jack per 11B-706.2.
 - 4. Receivers to be hearing-aid compatible shall interface with telecoils in hearing aids through the provision of neck loops per the 11B-706.3.
 - 5. ALS shall be capable of providing a sound pressure level of 110 dB minimum and 118 dB maximum with a dynamic range on the volume control of 50 dB per the 11B-706.4.
 - 6. The signal-to-noise ratio for internally generated noise in ALS shall be 18 dB minimum per the 11B-706.5.
 - 7. Peak clipping shall not exceed 18 dB of clipping relative to the peaks of speech per the 11B-706.6.
- 6. Provide balanced line-level audio connection between source and assistive listening transmitter. Cable shall be shielded twisted pair suitable for 1000 ft runs. Unbalanced audio wiring is not permitted.

1.3 SUBMITTALS

- A. Submittal Procedures and 26 05 00: Common Work Results for Electrical.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Experienced installer who is authorized representative of equipment manufacturer for

- both installation and maintenance of equipment required for this Section.
- 2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by testing agency acceptable to authorities having jurisdiction.
- B. Comply with CEC.
- C. Comply with UL 50.
- D. Assistive-listening systems.

1.5 CBC/ADA codes requirements:

1. It shall be provided in accordance with CBC Section 11B-219 and shall comply with CBC Section 11B-706.
2. The minimum number of receivers to be provided shall be equal to 4% of the total number of seats, but in no case are less than two. 25% minimum of receivers provided, but no fewer than two, shall be hearing-aid compatible in accordance with CBC Section 11B-706.3.
3.
 - a. (X) Seat Capacity of the field, $\text{Seat Capacity} \times 4\% = (Y)$
 - b. (Y) Receivers $\times 25\% = (Z)$ Hearing Aide Compatible.
 - c. Contractor shall provide and install applicable transmitter device(s) for integration with (Y) receivers.
4. If the system provided is limited to specific areas or seats, then such areas or seats shall be within a 50-foot viewing distance of, and have a complete view of, the stage or playing area. CBC Section 11B-219.4.
5. Refer to drawings sheet T1.2 general notes for more information and system part numbers.

1.6 WARRANTY

- A. The entire system shall be of one manufacturer and shall carry a 2-year (minimum) warranty. The system should be manufactured by **Listen technologies**.
- B. System configurations and part numbers on sheet T1.2 general notes and G sheets (20/G005).

PART 2 PRODUCTS

2.1 ASSISTED LISTENING SYSTEMS

- A. Provide and install complete, CBC compliant Assisted Listening Systems as
 1. The field shall have (as a minimum):
 - a. a. (x) Seat Capacity of the portable, $\text{Seat Capacity} \times 4\% = (Y)$
 - b. (Y) Receivers $\times 25\% = (z)$ Hearing Aide Compatible.
 - c. Contractor shall provide and install applicable transmitter device(s) for integration with (Y) receivers. The permanent antenna shall be located in the Behind the bleachers at centerline mounted on light pole, small mast or press box wall if exists. (10-15 ft above ground).
System type will be FM/RF assistive listening system. (standard FM antenna to be used).
Will be using one transmitter + one antenna is enough.
Antenna should be mounted towards seating.
- B. Contractor provides a small NEMA enclosure behind bleachers with transmitter inside.

- C. Total number of seats for this project includes the wheelchairs. Will be **121 seats**.
- D. Total number of **Receivers** will be required **6**. And **2 hearing aids**.
- E. **One (1)** transmitter part# (**LT-800-216**), one antenna part# [Remote Antenna – **LA-122**] Mounted on mast behind bleachers.
- F. Provide balanced line-level audio connection between source and assistive listening transmitter. Cable shall be shielded twisted pair suitable for 1000 ft runs. Unbalanced audio wiring is not permitted.

2.2 Product name and quantity:

- The system should be manufactured by **Listen technologies**.
- Stationary RF transmitter, (1) part (**LT-800-216**).
- Universal antenna kit, (1) part (**LA122**).
- RF receivers. (6) part# **LR-4200-216 / LR-5200-216 ETC**.
- (2) Neck loops. Part# **LA-438 (adult)**.
- Intelligent 12 unit charging tray. (1) part# **LA-381**.

PART 3 EXECUTION

3.1 COMMISSIONING

- A. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, and servicing of the system. Provide a minimum of 2 hours of training. Operators Manuals and Users Guides shall be provided at the time of this training.

ASSISTIVE LISTENING SYSTEMS
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SECTION 28 16 00

INTRUSION DETECTION SYSTEM

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes

1. The Contractor shall provide, install and program a functionally complete, integrated Digital Alarm Communicator and Access Control System (DACS) per manufacturer's guidelines, codes and specification requirements.

B. Related Sections

1. Division 1
2. Section 27 10 00: Structured Cabling
3. Section 28 23 00: Digital Video Surveillance System

C. Work Included

1. Provide a complete addressable Intrusion Detection System, including all necessary wire, cable, equipment, accessories, electrical requirements, and coordination with data communications contractor and/or District Maintenance Department for a complete turnkey solution.
2. This work is also intended to have the capacity to coordinate the control of the intrusion, surveillance, intercom, and lighting panel to provide the maximum coverage during an alarm event. Any omission in specified equipment will not relieve contractor of responsibility for furnishing a complete, fully functioning system per the District expectations.
3. Basic Materials are indicated on the Drawings and are in these specifications.

1.02 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI C63.4 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

B. Canadian Standards Association (CSA):

1. CAN/CSA E60950-1 Information Technology Equipment Safety.

C. Federal Communications Commission (FCC):

1. FCC CFR 47 part 15 class A - Telecommunications - Radio Frequency Devices - Digital Device Emission.

D. International Organization For Standardization (ISO):

1. 9001 - Quality System.

E. Underwriters Laboratories, Inc. (UL):

1. UL 50 Enclosures for Electrical Equipment.
2. UL 2043 Fire Test for Heat and Visible Smoke Release for Discrete Products and their Accessories Installed in Air-Handling Spaces.

3. UL 60950-1 Information Technology Equipment - Safety.

1.03 SUBMITTALS

A. Requirements

1. Submit under provisions of Section 01 33 00 – Submittals.
2. Contractor is to submit the following prior to construction for review:
 - a. Product Data
 - b. Shop Drawings
 - c. Qualification Statement
 - d. Construction Schedule
 - e. Training Schedule

B. Product Data

1. Intrusion Detection System data, user and installation manuals for all equipment and software programs required for complete intrusion detection system.

C. Shop Drawings

1. Provide complete electrical installation drawings (shop drawings) showing wiring, pathways, identification of cable, panel, equipment (active and inactive) IP addresses, and all associated equipment, layout and location of all, signaling devices, control panels and electrical supply panels for power connections to system. The Contractor shall also show location of, and connection to, all other devices and equipment which are included in the complete function of the intrusion system as specified herein, included will be Single Line diagrams, and Matrixes, prior to construction for district approval.
2. Provide complete point-to-point wiring diagrams showing the points of connection and terminals used for all electrical connections in the system, including internal wiring diagrams of all equipment.

D. Qualification Statement

1. The contractor must be certified with Bosch for at least twelve (12) months prior to Bid.
2. Provide installer's experience and qualifications, which shall include three (3) years of projects of similar complexity. Include names and locations of two projects successfully completed.
3. Provide documentation stating you have been in the telecommunication contracting business for a minimum of five (5) years under the same name and are located within a four (4) hour response time of the District.
4. Provide certification of the certified installer for this project.
5. Provide complete instructions on correct operation of system to personnel designated by District. All instructions shall be given during one (1) predetermined time period, coordinated with the District Technology Representative. Contractor shall send a confirming letter to the District Technology Representative giving date of instruction and names of District's personnel who were instructed.

1.04 CLOSEOUT SUBMITTALS

A. User manuals.

- B. Parts list.
- C. Record Documentation.
- D. System device locations on electrical floor plans.
- E. Wiring and connection diagram.
- F. Warranty Documentation.
- G. Three (3) copies of intrusion coverage map on laminated 11 x 17 papers for the site's use.
- H. Operating and maintenance manuals.
 - 1. A statement of guarantee including date of termination and the name and phone number of the person to be called in the event of equipment failure. Including 24-hour technical assistance program from Bosch.
 - 2. Complete record drawings of wiring, pathways, identification of cable, panel, equipment (active and inactive) IP addresses, and all associated equipment. Included will be Single Line diagrams, Matrixes, similar to submittal drawings.
 - 3. Detailed catalog data on all installed system components. Include a spare parts list.
 - 4. Copy of the test reports.

1.05 QUALITY ASSURANCE

- A. Intrusion Devices:
 - 1. Listed by UL specifically for the required loads. Provide evidence of compliance upon request.
 - 2. All equipment shall be new, completely factory assembled, wired and tested and shall be in conformance with NEC and UL. All systems and components shall have been thoroughly tested and proved in actual use.
 - 3. The DACS system shall be installed by a Bosch certified dealer/integrator. Certification for installation shall be conducted by Bosch and shall provide all necessary knowledge to fulfill the systemization and deployment across diverse networks and infrastructures, as well as provide commissioning abilities at the integrator level.
- B. Contractor/Installer Qualifications:
 - 1. All equipment and systems specified in this Section shall be provided and installed by a single Special Systems contractor who will be responsible for proper operation of this system.
 - 2. The Contractor shall be a Bosch-certified installer and properly trained by Bosch to install, modify, and service, the specified systems and equipment.
 - 3. The DACS System shall be installed by a Bosch certified dealer/integrator. Certification for installation shall be conducted by Bosch and shall provide all necessary knowledge to fulfill the systemization and deployment across diverse networks and infrastructures, as well as provide commissioning abilities at the integrator level.
 - 4. Work and related materials shall meet or exceed the requirements of the rules and regulations of the state of California, NFPA, Cal-OSHA, BICSI, and NECA – “Standards of Installation”. Installation showing evidence of poor workmanship or not in accordance with this Specification or the Drawings shall be re-accomplished or repaired to the satisfaction of the District's Representative at the Contractors expense.

5. The Contractor shall have a service facility and organization with staffing capable of providing comprehensive maintenance and service for the specified system within a 100 mile radius of the project.
6. The Contractor shall provide Bosch-certified technicians. Certified technicians shall install and supervise installation, commissioning, and maintenance of the work.
7. All installing personnel shall be licensed as required by local and/or state jurisdictions.
8. The Contractor shall have local in-house engineering and project management capabilities consistent with the requirement of the work. The Contractor shall provide a team managed by a project manager responsible for submittals, installation, scheduling, manpower, testing, record documents, subcontractors, final acceptance, warranties, etc.
9. By submitting a Bid Proposal, the Contractor certifies that it is qualified in all areas pertaining to the Work. In the event the Contractor becomes unable to complete the Work in accordance with the Contract Documents, or the satisfaction of the Owner or its representatives due to a lack of understanding of the equipment, system, or services required by the Contract Documents, the Contractor shall retain the services of the applicable manufacturer's representatives to expeditiously complete the Work in accordance with the construction schedule at no additional cost to the Owner.
10. Bidders shall submit documentation with the Bid Proposal as required to demonstrate compliance with Contractor Qualifications. References shall include contact information for end users familiar with the installation and continued operation of the systems, and the Contractor's work.

1.06 DELIVERY STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers; and unharmed original identification labels to the district for inventory and assets tagging.
- B. Protect stored materials from environmental and temperature conditions following manufacturer's instructions.
- C. Handle and operate products and systems according to manufacturer's instructions.

1.07 WARRANTY

- A. Manufacturer's Warranty:
 1. Provide a Bosch (2) two year manufacturer's warranty covering 2 years for replacement and repair of defective equipment.
- B. System Warranty:
 1. Provide a (1) one year warranty for the work (System Warranty). The warranty shall begin after acceptance of the Work by the Owner or the District's Representative.
 2. If, within (1) one year after the date of final acceptance of the work or within such longer period of time as may be prescribed by law, or by the terms of any applicable special warranty required by the Contract Documents or provided by Bosch, any of the Work or equipment is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly including all parts and labor after receipt of notice from the Owner to do so unless the Owner or its representative has previously given the Contractor a written acceptance of such conditions. This obligation shall survive termination of the Contract. The Owners representative shall furnish such notice either verbally or in writing.

3. Nothing contained in the Contract Documents shall be construed to establish a shorter period of limitations with respect to any other obligations which the Contractor might have under the Contract Documents or any manufacturer's warranty.
4. The establishment of the time period of (1) one year after the date of final acceptance of the Work or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents, relates only to the specific obligations of the Contractor to correct the work or equipment, and has no relationship to the time within which its obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to its obligation other than specifically to correct the Work or equipment.
5. Furnish written notice to the Owner documenting any Work performed during the warranty period, including any preventive maintenance Work performed.
6. The Owner reserves the right to expand or add to the system during the warranty period using firm(s) other than the Contractor for such expansion without affecting the Contractor's responsibilities, provided that the expansion is done by a firm which in an authorized dealer /installer or agent for the equipment or system being expanded. Contractor shall not be responsible for maintenance of equipment installed by other firms.
7. In addition, the Contractor shall be responsible for the administration of manufacturers' equipment warranties that exceed the 3 year system warranty.

PART 2 – GENERAL

2.01 MANUFACTURER

A. Bosch Security Systems, Inc., No Substitutions are permitted – District Standard.

1. The DACS shall include a Digital Alarm Communicator Transmitter (DACT), built-in telephone line monitor, up to 1000 event memory logger, real time clock, calendar, test timer, battery charging / voltage supervision circuitry, battery lead supervision, diagnostics displays, time / event-based scheduling system, lightning / EMI protection circuits, and the associated scheduled modules and components for a complete DACS.
2. The DACT firmware shall support programmable "software" features as specified. The following describes the general functional requirements of the DACS:
 - a. The DACS shall support the connection and reporting of intrusion, fire detection and access control devices to a remote Digital Alarm Communicator Receiver (DACR).
 - b. The DACS shall provide identification, annunciation, and communication of alarmed detectors by point and each access control user by number.
 - c. The DACS shall be capable of segregating the points (i.e., a detector or group of detectors zoned together) into separate, independent "areas." The District will provide the layout for the zones and keypad locations.
 - d. The DACS shall be "modularly" expandable using hard-wired address identification modules.
 - e. The DACS shall have electrically supervised detection loops and power supplies with battery(s) maintenance. This supervision shall be programmable for the purposes of reporting this information to the DACR.
 - f. The DACS shall be capable of monitoring and switching to active telephone lines when trying to establish communications with the DACR and transmitting a report.

- g. The DACS shall be capable of reporting and communicating alarm or trouble event data by reporting to one, two, three or four off-site remote DACRs via, over a local or wide area network using a network interface module, the DACS shall be capable of switching to active telephone lines as a redundancy and backup system, if the network fails. The DACS shall be capable of sending (manually or automatically) test and status reports to remote DACRs.
- h. The DACS shall be programmable locally or remotely. Programming shall be accomplished via a portable programmer or a computer running the Remote Programming Software (RPS). Provide a minimum of four (4) RPS with Dongle at no cost to the District. Users shall be capable of changing their own user passcode from the District Central Station and the site and managers shall be capable of changing the user passcodes and authority assignments by area of other users from the ACC.
- i. The DACS shall annunciate alarm, trouble, service reminders, and other relevant system status messages in custom English text at the ACC.
- j. The DACS shall be capable of executing diagnostics and testing functions locally or remotely.
- k. The DACS shall be capable of controlling relays and automatically executing system functions based on a time / event scheduling program. The program can be hour, day of week or day of month based. Each scheduled event can be exclusive of one of four holiday date definitions that can include one to 365 selected Julian dates. The following functions can be executed
 - 1. Arm / Disarm a specific area.
 - 2. Bypass / Unbypass a point
 - 3. Activate / Deactivate a relay.
 - 4. Send a test report.
 - 5. Adjust system clock for daylight savings time.
 - 6. Turn an Access Authority Level On / Off.
 - 7. Hold a Door Open (unlocked and shunted).
 - 8. Secure a Door Closed (locked, no valid cards will allow entry).
 - 9. Return a Door to Normal Operation (locked, valid cards will allow entry).
 - 10. Turn recording of Access Granted events On / Off (and transmittal if routing is ON).
 - 11. Turn recording of Access Denied events On / Off (and transmittal if routing is ON).
 - 12. The DACS shall be capable of listening to calls answered by other devices on the premises side of the phone line and determining if a special tone is being sent from the incoming call (Remote Programming Software) and intercepting the call for Remote Programming Software Sessions.

2.02 SYSTEM SOFTWARE/HARDWARE CAPABILITIES, CAPACITIES, AND FORMATS

- A. Number of Loops/Sensors will be determined by the project site needs.
 - 1. 246 separately identifiable points, of which 8 are on-board loops and 238 are off-board addressable points / zones connected to multiplexed backbone trunks.
 - 2. A minimum of 75 separately identifiable points, of which 8 are on-board loops and

- 67 are off-board addressable points / zones connected to multiplexed backbone trunks.
3. Each of the points shall be capable of supporting "group zoning." Group zoning refers to the combining of sensors into a separately identifiable and separately annunciated (programmable text) area.
- B. Programming Point Functionality: Each point in the system shall provide for the following type of response in the system.
1. Always on (24 hour response).
 2. On when the system is Master Armed.
 3. Only on when the system is Perimeter Armed.
 4. Displays / Does Not Display at the ACC when the point is activated.
 5. Provides / Does Not Provide entry warning tone.
 6. Sounds / Does Not Sound audible alarm indication.
 7. The Point is by-passable / not by-passable.
 8. Alarm Verification with programmable verification time.
 9. Relay activation by Point.
 10. Provides / Does Not Provide "watch point" capability.
 11. Provides Swinger Bypass.
 12. Defers Bypass Report.
 13. Can return to the system after being force armed and then restoring.
 14. Can return to the system after being bypassed and then restoring.
- C. Areas/Accounts: The DACS shall support 32 independent areas. Each of the thirty two areas shall have custom text associated with the armed state, disarmed state and point-off-normal state. Additionally, the DACS shall be capable of assigning 1 to 32 account identifiers to the areas depending on the distribution of areas per account. Each and all of the thirty two areas must be capable of Master and/or Perimeter arming (excluding predefined Interior protection).
- D. The DACS shall be capable of logically grouping 2 or more points into an area, or conversely, dividing the points into two or more areas.
- E. Any area shall be configurable to allow arming by specific users when a programmable number of devices are faulted or bypassed.
- F. Areas shall be independently controlled by their corresponding ACC. Each ACC can be designated to control a specific area, or group of areas, or all areas in the system.
- G. Independent control or relay functions by area shall be possible through programming assignments.
- H. Number of Alarm Command Centers: 32 Unsupervised ACCs, each capable of displaying custom English text on LCD Keypad 80 characters and sounding different patterns of audible alarm for different events, shall be required. Up to 8 ACCs can be supervised at one time.
1. An ACC can be programmed to respond to the entry of any of the specifically authorized 250 user passcodes (followed by the [ENT] key) and cycle an assigned access control door using a connected door controller.
 1. An ACC can be programmed to respond to the entry of any of the specifically

- authorized 100 user passcodes (followed by the [ENT] key) and cycle an assigned access control door using a connected door controller.
2. The event is logged and transmitted (if routing is ON) to the DACR including door and user identity.
- I. Number of User Passcodes shall be determined by the project site needs, coordinate with District staff.
1. Each passcode shall be 3 to 6 digits (variable) and be assigned a 16- character user name that shall be printed on the local printer and DACR with associated opening and closing reports from the user. Passcodes shall be enabled or disabled by area(s) and shall be assigned one of fourteen different authority levels to carry out functions such as the activation of relays from the ACC. These passcodes shall also be required for carrying various system functions such as arming the system, disarming the system, transmitting a duress code, resetting the system and silencing sounders. A single user passcode shall be able to be used in each of the 8 areas with potentially a different authority level in each area.
- J. Communication Formats: The Modem IIIa2 or Contact ID communication formats shall be utilized for optimum system performance. Alarm Receivers shall be determined by the project site needs, see plans.
1. The DACT shall report to a District Central Station using a Bosch Security Systems D6100i-01 Alarm Receiver, or D6600 Alarm Receiver that supports the Modem IIIa2 or Contact ID communication formats.
 2. Alarm receiver shall provide point identification information transmission to DACRs (Alarms, Troubles and Restores by point).
 3. Alarm receiver shall provide actual point number; point text; actual user number, user name; by-passed points; relay activation; opening/closing reports by users; late, early, or fail opening/closing reports, and opening/closing reports by area.
- K. Testing, Diagnostic, and Programming Facilities: Automatic test reports and remote system access for diagnostics, programming, and log (Logger) uploads shall also be supported via a remote central station computer utilizing the RPS software.
- L. Logger Capacities and Formats: Up to 1000 events indicating time, date, type of event, account number, area number, user ID, point text, user text and primary/secondary event route each event. Logs shall be viewed locally at the ACC and remotely via an upload to a computer running the RPS software. The DACS shall also support the printing of these events on up to three local printers. The DACS shall also send a report to the DACR when the log reaches a programmable "percent full capacity" so that RPS can retrieve the stored events. Group, signal type and area can route events to specific printers.
- M. Reports: Reports to DACRs at District Central Station as a result of system supervision shall include alarm, trouble, missing modules, restoral, system status, AC failure and low battery. The DACS shall also transmit test reports once every 24 hours. CPU failure shall be annunciated locally. The ACCs should display the following information for the indicated system supervisory conditions:
1. Call for Service.
 2. Service Panel.
 3. Service Param
 4. Service AC Fail.
 5. Service Battery Low.
 6. Service Battery Missing.

7. Service Communications Failure.
 8. Service Keypad.
 9. Service Route.
 10. Service Printer.
 11. Service Point Buss Failure.
- N. IP Addresses and "Phone Routing": The DACS shall have the capability of communicating with up to eight different DACRs and four different IP Addresses. The DACS reports shall be classified, by event, into eleven subcategories or "report groups." Each group represents similar types of events. Individual events within each group shall be selectively enabled or disabled to be transmitted. Each DACR shall be designated as a primary, backup, or duplicate destination for each report group. Assigning an event to multiple routing groups provides for duplicate destination for the event. The transmission of events allows the reporting of different types of information to different remote DACRs. The eleven report groups shall be as follows:
1. Fire Reports.
 2. Burglar Reports.
 3. User Reports.
 4. Test Reports.
 5. Diagnostic Reports.
 6. Relay Reports.
 7. Auto Function Reports.
 8. RPS Reports.
 9. Point Reports.
 10. User Change Reports.
 11. Access Reports.
- O. Number of Programmable Relay Output Modules shall be determined by the project site needs, see plans,
1. 8 relays (Form C) are to be provided per octo-relay module for a total of 128 relays plus three additional outputs per DACS.
 2. These multi-purpose modules are programmable and shall be used to implement auxiliary functions (manually or automatically).
- P. Relays and other outputs may be programmed to follow up to 14 different area conditions or up to 12 panel conditions. Relays may also be programmed to follow individual points or groups of points.
- Q. Number and Alarm Output Selections: Four different types of alarm output selections shall be supported by the DACS: Steady, Pulsed, California Standard, and Temporal Code 3.
- R. The system can be configured to provide zoned indication of alarm conditions.
- S. Miscellaneous Features: Programmable alarm output timer, 31 programmable entry delay times, exit delay programmable by area, individually programmable point of protection text, point bypassing, and key switch arming capability with LED outputs.
- T. Real-Time Clock, Calendar, and Test Timer: The DACS shall incorporate an integral real-time clock, calendar, and a test timer.
- U. Opening and Closing Windows: The system shall be programmed with "normal" opening

and closing periods for each day of the week and thus suppress scheduled opening / closing reports and report only the exceptions, i.e., opening / closing outside the pre-defined time window. The DACS shall have the capability to suppress opening / closing reports, overriding the programmed open / close windows during holidays and automatically arming the DACS (by area) at the end of the closing period.

- V. DACS Power Ratings: The DACS shall provide 1.4 amps of auxiliary power and 2 amps of alarm power, both rated at 12 VDC.
- W. DACS Fault Detection: The DACS shall check the point sensor loops once every 300 milliseconds. The point response time is programmable over a range of 300 milliseconds to 4.5 seconds.
- X. The DACS shall incorporate a programmable "Passcode Follows Scope" feature that can be programmed to allow users to arm or disarm only the area they are entering with one simple command or control all areas from one keypad.
- Y. The DACS shall include an early ambush feature that requires that the user disarm, and then inspect the facility within a specified time period, before entering their passcode again. If the user does not enter their passcode a second time, a duress event is generated. If the end user does enter their code within the specified time period, the system disarms. In addition, the system must have a programmable feature that requires that two passcodes are entered to disarm the system. After one code is entered, the system will prompt for a second code.
- Z. User-Programmable Features: The DACS shall provide a menu driven interface to provide a user-friendly command structure for programming / customizing the system to the operational criteria of the application. The DACS shall be capable of being operated via:
 - 1. The Command Structure.
- AA. These system features shall have restrictions based on 14 individually programmable levels of passcode authority that can be assigned to system users. The user's passcode shall have the capability of being assigned a different authority level in each of the eight areas. A service passcode can be assigned to the servicing agent allowing the agent limited access to system functions. User-programmable / activated functions include:
 - 1. Arming the system: All areas, specific area(s) only, perimeter instant, perimeter delayed, perimeter partial, watch mode, and arming the system with a duress passcode.
 - 2. Disarming the system: All areas, specific area(s) only and disarming with a duress passcode.
 - 3. Viewing system status: Faulted points, event memory, bypassed points, area status and point status.
 - 4. Implementation functions: Bypass a point, un-bypass a point, reset sensors, silence bell, activating relays, initiating the remote programming function locally to allow programming the system from a remote location. The ACCs can also be temporarily readdressed to view the status of a remote area.
 - 5. Testing the system: Local Walk test, Service Walk test, Fire test, send report to remote DACR to check the telephone link, and programming the time and date for the next test report transmission.
 - 6. Change system parameters: ACC display brightness, system time and date, and add/delete/change passcodes.
 - 7. Extend the closing time of system.
 - 8. Transmitting special alerts and activating audible and visible signals.
 - 9. Executing multiple commands / ACC keystrokes from a single Menu / Command

List item. This function shall be able to have a 16 character (alphanumeric) title to identify it on the ACC display.

10. Editing of time / event based scheduling program from the ACC.
11. The DACS shall also provide a "service menu" to implement functions such as viewing and printing the system log, displaying the system firmware revision number, and defaulting (toggling) text displays between custom and default text displays for troubleshooting.

2.03 SYSTEM INTERFACE REQUIREMENTS

- A. Grounding: The Contractor shall properly earth ground the DACS to prevent electrostatic charges and other transient electrical surges from damaging the DACS panel.
- B. Primary power: The Contractor shall provide a dedicated 120 VAC power circuit to the DACS system. This circuit shall be connected to the emergency power system. The 120 VAC is stepped down to 16.5 VAC to power the DACS panel using a class two, plug-in transformer. This power circuit shall be properly rated to continuously power all points and functions indefinitely in full alarm condition.
- C. Primary power supervision: When the primary power source fails, the system can be configured to report an "AC Fail" message to a District Central Station. The transmission delay of this message is programmable from 5 seconds to 86 minutes with an optional 6 to 12 hour transmission delay. The message can also be programmed to "tag-along" with another message transmitted to the central station. The system will always display a loss of primary power on the ACC and may be configured to provide additional audible warning.
- D. Secondary power (standby battery): The Contractor shall provide adequate battery power as defined by the relevant application criteria, (UL 864 and 985 for alarm installations or NFPA 72 chapters for fire applications). Appropriate battery chargers shall be provided consistent with the battery back-up capacity. The most current accepted version of NFPA 72 and any applicable local codes or AHJ requirements must be met accordingly.
- E. Secondary power supervision: When the secondary power source experiences an 85 percent depletion of its standby capacity, the system can be configured to report a "Low Battery" message to a commercial central station. The system will always display a low battery condition on the ACC and may be configured to provide additional audible warning.
- F. Wiring: The contractor shall provide cables consistent with the manufacturer's recommendations. The following general guidelines shall be followed for wiring installation:
 1. Wiring shall be appropriately color-coded with permanent wire markers. Copper conductors shall be used.
 2. All signal cables provided under this contract shall be Class II, plenum-rated cable where required. Where subject to mechanical damage, wiring shall be enclosed in metal conduits or surface metallic raceway.
 3. Data wires shall not be enclosed in conduit or raceways containing AC power wires.
 4. Where EMI may interfere with the proper operation of the DACS circuits, twisted/shielded cable shall be used.
 5. Cabling shall be homerun for every motion detector. No daisy chain or looping of cabling.
- G. The DACS shall be protected from EMI and lightning surges.
- H. Ethernet interface: The DACS shall use an Ethernet interface module as the primary, means of communicating to a DACR. Up to four IP Addresses shall be available to route system events to. A programmable supervision time of 5 to 65,535 seconds shall be required. This

module may be programmed for 128-bit AES encryption if required. Provide Ethernet Interface.

- I. Telephone interface: The DACS shall be equipped with a back up phone line monitor and shall interface with the phone lines via RJ-31X jacks for supervision of the telephone line connection to the DACS panel.
- J. Functional criteria programmed into system memory shall be backed up by battery power. Additionally, the number of system programmers shall be severely restricted via the use of program locking features and passwords.

2.04 SYSTEM HARDWARE:

- A. The DACS control panel shall be Bosch Security Systems model D9412GV4.
- B. DACS: The DACS shall be provided, at minimum, with the following components. Additional accessories shall be provided based on the quantities and features required for the application.
 - 1. Enclosure.
 - 2. Lock and key.
 - 3. DACT with removable terminal blocks and single screw mounting bracket.
 - 4. Faceplate shield and metal bracket covering rear of circuit assembly.
 - 5. Power transformer.
 - 6. Manuals.
 - 7. The DACS control panel shall be Bosch Security Systems model D9412GV4 Control Panel
 - 8. Fully integrated intrusion allows users to interface with one system instead of two.
 - 9. Conettix IP based communication option provides high-speed, secure alarm transport and control.
 - 10. Four programmable areas with perimeter and interior partitioning.
 - 11. 40 points with flexible configuration options to meet application specific requirements.

2.05 KEYPADS

- A. The keypads shall be Bosch Security Systems model D1260 Series LCD Keypads.

2.06 SYSTEM ACCESSORIES

- A. D9127 Series POPIT Modules
- B. D8128D OctoPOPIT Eight Point Expander
- C. D8125 Addressable Expansion Module
- D. Motion Detector Wire Guard: By Safety Technology International, Inc., or Approved Equal, at exterior accessed restrooms.

2.07 INTRUSION INDICATING DEVICES

- A. Typical Classroom including all gypsum board and T-bar ceiling shall be DS9360
- B. Hallways shall be ISC-PDL1-WA18
- C. Office/Administration spaces with ceiling mounting heights of 8-18ft shall be DS9360
- D. Office/Administration spaces with ceiling mounting heights of 8-25ft shall be DS939

- E. Multi Purpose Room/Gym shall be ISC-PPR1-WA16 located in the corners.
- F. Library for T-bar ceiling areas shall be ISC-PPR1-WA16
- G. Library for gypsum board ceilings shall be DS9360

2.08 COMMUNICATION MODULES

- A. Conettix DX4020 Ethernet Network Interface Module
- B. D166 Telephone Jack RJ31X
- C. Conettix D6680 Ethernet network Adapter
- D. Programming
 - 1. Model D5500C-USB remote programming software.: Remote Programming Software (RPS).

2.09 WIRELESS RECEIVERS AND TRANSMITTERS can only be utilized with prior District approval.

- A. DSRF Premises Wireless:
 - 1. Receiver: RF3224 RF Receiver (304.00 MHz) as manufactured by Bosch Security Systems, Inc.
 - a. Allows compatible control panels to use wireless devices; operates at 304.00 MHz
 - 2. Transmitter: RF280THS Series Wireless Photoelectric Smoke Detectors as manufactured by Bosch Security Systems, Inc.
 - a. Includes the RF280THS and the RF280ETHS.
 - 3. Transmitter: RF835 Series Wireless Tri-Tech Detectors as manufactured by Bosch Security Systems, Inc.
 - a. Includes the RF835, RF835E, and RF835E-C models.
 - 4. Transmitter: RF920 Wireless PIR Detector as manufactured by Bosch Security Systems, Inc.
 - a. A high-performance PIR detector that uses advanced signal processing to provide outstanding catch performance.
 - 5. Transmitter: RF1100 Glass-break Transmitter as manufactured by Bosch Security Systems, Inc.
 - a. Equipped with two tamper switches and four glass-break sensitivity settings.
 - 6. Transmitter: RF3332 Series Key-fobs as manufactured by Bosch Security Systems, Inc.
 - a. Includes the RF3332 (304.00 MHz) and the RF3332E (433.42 MHz) models.
 - 7. Transmitter: RF3334 Series Key-fobs as manufactured by Bosch Security Systems, Inc.
 - a. Includes the F3334 and the RF3334E models.
 - 8. Transmitter: RF3341 Wireless Keypad as manufactured by Bosch Security Systems, Inc.
 - a. One-way wireless keypad transmitter; compatible with the RF3224 Receiver and with the RF3222 Receiver.
 - 9. Transmitter: RF3401 Series RF Point Transmitters as manufactured by Bosch

Security Systems, Inc.

- a. Includes the RF3401 (304 MHz) and the RF3401E (433.42 MHz) models.
- 10. Transmitter: RF3402 Recessed Wireless Magnetic Contact as manufactured by Bosch Security Systems, Inc.
 - a. Provides concealed protection on doors and windows.
- 11. Transmitter: RF3405E Wireless (RF) Inertia Transmitter as manufactured by Bosch Security Systems, Inc.
 - a. Monitors doors and windows via an inertia sensor.
- 12. Transmitter: RF3502 Panic Key Fob (304 MHz) as manufactured by Bosch Security Systems, Inc.
 - a. Sends panic code when both keys are pressed for 3 seconds.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive devices and notify adverse conditions affecting installation or subsequent operation.
- B. Do not begin installation until unacceptable conditions are corrected.
- C. If preparation is the responsibility of another installer, notify architect of unsatisfactory preparation before proceeding.
- D. Ensure selected location is secure and offers protection from accidental damage.
- E. Location shall provide reasonable temperature and humidity conditions, free from sources of electrical and electromagnetic interference.
- F. Ensure power source is protected against accidental shutoff.
- G. Install all equipment and materials in accordance with the "current" recommendations of the manufacturer. The work shall also be in accordance with:
 - 1. Installation criteria defined in these specifications and in the construction documents.
 - 2. Factory Representative can be the Bosch Security Systems Security Dealer.
 - 3. Approved submittals.
 - 4. Applicable requirements of referenced standards.
- H. The contractor shall provide the following services as part of the contract:
 - 1. Supervision of sub-contractors.
 - 2. Coordination of other contractors for system-related work (electrical contractor, finish hardware contractor, architect, and general contractor).
 - 3. Attending site construction/coordination meetings.
 - 4. Keeping updated construction drawings at the construction site.
 - 5. Meeting construction deadlines per the construction schedule.
- I. Programming of the system shall include the following tasks:
 - 1. Programming system configuration parameters (hardware and software, zone/circuit numbers, communication parameters).

2. Programming operational parameters such as opening/closing reports and windows, system response text (custom English) displays of events, activation of relays that drive auxiliary devices, and identifying types of zones/loops.
 3. Programmings pass codes according to the authorities and functions defined by the owner.
 4. Other system programming tasks required by the owner. These additional programming requirements shall be coordinated between the owner and the contractor. Testing Wireless system for stability of communications and testing for “dead” spots.
 5. Operational Testing: The contractor shall perform thorough operational testing and verify that all system components are fully operational.
 6. Hard-copy System Printout and Electronic File. The contractor shall submit a hard-copy system printout and an electronic file with software to read the file of all components tested and certify 100 percent operation indicating all devices/panels/units have passed the test criteria set forth by the manufacturer.
 7. Acceptance Test Plan Form: An acceptance test plan form shall be prepared/provided by the contractor prior to the acceptance walk-through.
 8. This form shall include separate sections for each device/panel/unit as well as a column indicating the manufacturer's performance allowance/margin, a column indicating the result of the testing performed by the contractor (pass/fail), and an empty column for recording findings during the walk-through.
 9. Fire Alarm Systems shall comply with NFPA 72 Standards for inspection, testing, and maintenance.
- J. The contractor shall certify completion in writing and schedule the commissioning walk-through. The contractor shall provide all the tools and personnel needed to conduct an efficient commissioning process.

3.02 TRAINING REQUIREMENTS

- A. Installing contractor shall submit a schedule of District staff training according to the time line below (Attachment A).
1. Prior to establishing a training schedule, Contractor will verify operational status of system with District Technology Representative and Bosch.
 2. District personnel will be trained in the operation of the intrusion system by the contractors factory authorized trainers, scheduled and coordinated by the Contractor.
 3. Training will be performed both in the system with the Mouse and through their individual web browser at their desks.
 4. Training will be according to the Training Time Line Schedule
- B. Training System Tuning Timeline

Training												Hrs. Per school site
Site staff	Hrs.	Site staff	Hrs.	Site staff	Hrs.	Site staff	Hrs.	Site staff	Hrs.	Site staff	Hrs.	
Principals		Principals Staff IT/IS		Principals Staff IT/IS				Principals Staff IT/IS				0
Total Hrs.	2	Total Hrs.	1	Total Hrs.	1	Total Hrs.	0	Total Hrs.	0	Total Hrs.	0	4
District Staff		District Staff		District Staff		District Staff		District Staff		District Staff		District Staff total Hrs
Maintance IS Dept. School Safety Dispatch						Maintance IS Dept. School Safety Dispatch		Maintance IS Dept. School Safety Dispatch		Maintance IS Dept.		0
Total Hrs.	2	Total Hrs.	0	Total Hrs.	0	Total Hrs.	2	Total Hrs.	0	Total Hrs.	8	4
Total Training Hours												8

3.03 FIELD QUALITY CONTROL

- A. Installation contractor shall submit a written test report that the system has been 100% tested and approved. Final test shall be witnessed by the owner, engineer, electrical contractor, chief security officer, and performed by the installation contractor.
- B. Provide instruction to the owner's satisfaction with regard to proper use and operation of the system.
- C. Determine and report all problems to the manufacturer's customer service department.

3.04 DEMONSTRATION

- A. Demonstrate at final inspection that intrusion system and devices functions properly.
 1. The Contractor upon completion of installation shall furnish training in the complete operation of the systems.

END OF SECTION 28 16 00

SECTION 28 23 00
DIGITAL VIDEO SURVEILLANCE SYSTEM

PART 1- GENERAL

1.01 SUMMARY

A. Section Includes

1. Video Surveillance Remote Devices.
2. Video Surveillance Monitoring and Supervisory Interfaces.
3. Video Surveillance Systems Infrastructure.

B. Related Sections

1. Division 1
2. Section 26 05 00 – Electrical Demolition
3. Section 27 10 00 – Structured Cabling
4. Section 27 20 00 – Active Data Infrastructure

Related Documents

5. This section relates directly to the Drawings and the Requirements of the Contract Documents, including General and Supplementary conditions.

C. Work Included

1. Provide a complete Bosch Digital Video Surveillance System at sites indicated in the contract documents. This includes all necessary wire, cable, equipment, maps, accessories, SD cards, electrical requirements, network configurations of new and existing network equipment, and coordination with data communications contractor and/or District IS personnel for a complete turnkey system.
2. Tie each site into the District's existing Bosch BVMS system. New instances of BVMS will NOT be accepted. Contractor must integrate into existing BVMS and provide all licensing required to be compatible with that server.
3. Any omission in specified equipment will not relieve contractor of responsibility for furnishing a complete, fully functioning system per LBUSD expectations.
4. Basic Materials are indicated on the Drawings and are in these specifications.

D. CONTRACTOR shall provide to the owner the following:

1. CONTRACTOR to coordinate a site-walk with DISTRICT REPRESENTATIVE prior to the commencement of work at each building for camera placement verification.
2. Install a minimum of two (2) Bosch Operator Client software to the district computers. Provide and install accompanying licenses on BVMS server as detailed in Products. Coordinate with DISTRICT REPRESENTATIVE to obtain access to District computers and mobile devices.

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3. CONTRACTOR shall program and configure the workstations with the ability to view live images from any video camera at the campus, as well as review/playback any stored video images from the local CCTV storage device. This will require the Contractor to import and update maps within the BVMS software. The required file format for maps is .dwf. Contractor may use up to date satellite maps freely available online. If no current maps are available Contractor may reach out to District Representative to request to use an edited site plan.
4. CONTRACTOR to assess all pathway and determine the best pathway to pull the cable. Limit the amount of exposed conduit runs if the option to run cable above ceiling spaces, hatch spaces, or in areas less exposed is available. Provided those spaces have been cleared by hazmat consultant of hazardous materials.
5. CONTRACTOR shall provide and include all conduit, surface mounted raceway, wall and ceiling penetrations, etc. as required to perform all work indicated. If wall penetration is required, provide fireproof caulking and sealant. All walls and ceilings shall be repaired and painted to match surrounding surfaces to the satisfaction of the DISTRICT REPRESENTATIVE.
6. Where a new Storage Divar is in scope CONTRACTOR shall install and connect Tripp lite 1500 series UPS with SNMP Web card to MDF rack and connect CCTV storage unit to UPS. CONTRACTOR shall connect all cabling to local network switch as required and arrange for configuration of switch ports as indicated by DISTRICT REPRESENTATIVE. Furnish Tripp Lite SU1500RTXLCD2U, with SNMP Web Management Card for remote monitoring, Further specifications for the UPS can be found in the Active Infrastructure specification division 27 20 00.
7. CONTRACTOR shall provide dedicated 120vac circuits including receptacles, conduit, wiring, junction boxes, fittings, etc. as required. Provide a two gang box with a dual receptacle. Provide a 20 amp circuit breakers in the panel board and connect as required. Extend ¾" conduit with 3#12 and 1#12G from 120vac circuit panel to 20 amp circuit breaker. Provide all required mounting hardware for circuit breakers and match the AIC rating of the existing devices. Verify exact locations in field with DISTRICT REPRESENTATIVE.

1.02 REFERENCES

A. Definitions

1. Divar: The central video storage server at each campus which connects to the network.
2. District Representative: An employee working with the district with a verifiable amount of familiarity and authority with the project. Generally this will be someone with a Project Manager, Engineer or Technician title.
3. BVMS: The central management server for the Bosch camera system. This is an existing virtual machine in our district. A new BVMS instance will not be accepted. All cameras, workstations, encoders and Divars must tie back to the existing BVMS server.
4. Dinion Imaging Technology: An accurate 10-bit digital signal processing technology from Bosch that automatically activate the Night Sense feature to extend sensitivity under low-light conditions by a factor of three in monochrome operation.
5. Privacy Masking: The ability to mask out a specific area to prevent it from being viewed in order to comply with privacy laws and particular site requirements.

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6. Tri-streaming: A Bosch encoding technology that generates two separate H.264 video streams and one JPEG stream simultaneously. This advanced streaming capability enables the user to tune live viewing and recording requirements independently to meet specific site and enterprise requirements.
7. Back Light Compensation: Selectively amplifies parts of the image to compensate for large contrast differences when only a portion of the image is brightly lit (e.g. a person in a sunlit doorway)
8. Day/Night (infrared sensitive): A camera that has normal color operation in situations where there is sufficient illumination (day conditions), but where the sensitivity can be increased when there is little light available (night conditions). This is achieved by removing the infrared cut filter required for good color rendition. The sensitivity can be further enhanced by integrating a number of fields to improve the signal-to-noise ratio of the camera (this may introduce motion blur).
9. SensUp (sensitivity up): Increases camera sensitivity by increasing the integration time on the CCD (lowering shutter time from 1/50 s to 1/5 s – PAL; 1/60 s to 1/6 s - NTSC). This is accomplished by integrating the signal from a number of consecutive video fields to reduce signal noise.
10. Smart BLC (Back Light Compensation): Smart back-light compensation allows the camera to automatically compensate for bright areas of a high contrast scene without having to define a window or area.
11. Automatic Gain Control (AGC): a process by which gain is automatically adjusted as a function of input or other specified parameter.
12. Sensitivity: refers to the minimum level of light the CCD chip needs to generate an acceptable video picture, and is measured in lux.
13. MPEG-4: is a video encoding and compression standard that uses inter-frame encoding to significantly reduce the size of the video stream being transmitted. This often provides substantial compression because in many motion sequences, only a small percentage of the pixels are actually different from one frame to another.
14. Dual Streaming: is a feature that allows users to adjust frame rate, compression standard, and video resolution for different purposes simultaneously.
15. Multicasting: enables the network switch to automatically clone data if multiple recipients want to view the same data or video.
16. 4CIF: resolution is four (4) times higher than that of CIF images, or 704 pixels wide and 576/480 (PAL/NTSC) pixels tall (704 x 576/480).
17. LCD: A Liquid Crystal Display is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector.
18. Response Time: The minimum time necessary to change a pixel's color or brightness.
19. S-video: Separate video, also known as Y/C, is an analogue video signal that carries the video data as two separate signals: brightness and color.
20. Contrast Ratio: The ratio of the intensity of the brightest bright to the darkest dark.
21. Disk on Module (DoM): Solid-state, non-volatile memory module that contains a backup image of all system software needed to a full system recovery.

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22. RAID: Redundant Array of Independent Disks is a technology that employs the simultaneous use of two or more hard disk drives to achieve greater levels of performance, reliability, and/or larger data volume sizes.
23. FQDN: A Fully Qualified Domain Name is the complete domain name for a specific computer, or host, on a network.
24. iSCSI: Internet SCSI is a protocol that allows clients (called initiators) to send SCSI commands to SCSI storage devices (targets) on remote servers via an IP network.
25. SNMP: Simple Network Management Protocol is a component of the Internet Protocol Suite as defined by the Internet Engineering Task Force (IETF). SNMP is used in network management systems to monitor network-attached devices for conditions that warrant administrative attention.
26. Intelligent video analysis (IVA): is an automated real-time software solution that continually and accurately analyzes incoming video against a predefined set of rules to detect and notify appropriate personnel of violations and abnormal events.
27. VCA: video content analysis refers to the systematic evaluation of video for significant features within a series of frames.
28. Motion Detection: refers to detecting a moving object in a video sequence.
29. VMS: Video Management System refers to an enterprise IP video security solution that provides seamless management of digital video, audio and data across any IP network. It is designed to work with Bosch CCTV products as part of a total video security management system.
30. Recording at the Edge: is the concept of taking audio/video from a camera and storing it at the “edge” of the Ethernet network - instead of transporting it across the network to a centralized recording facility such as a network video recorder.
31. Video over IP: transmission of digital video via a PC display over an IT infrastructure with the use of a server and network storage.
32. IP Camera: conventional analog camera with an embedded encoder that directly generates an IP video stream.
33. Encoders and Decoders: devices that transmit video, audio and data to video management system recording devices via an IP network such as Ethernet LAN, WAN or Internet.
34. FIR camera: far infrared thermal cameras detect and track objects through areas of low or no visibility such as with smoke, dust, fog and total darkness.
35. SCCS: Structured communications cabling system.

B. Reference Standards:

1. Provide systems which meet or exceed the requirements of the following publications and organizations as applicable to the Work of this Section:
 - a. Canadian ICES-003
 - b. Consultative Committee for International Radio (CCIR)
 - c. Conformity for Europe (CE)
 - d. Electronic Industry Association (EIA)
 - e. Federal Communications Commission (FCC)

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- f. Joint Photographic Experts Group (JPEG)
- g. National Television Systems Committee (NTSC)
- h. Phase Alternating by Line (PAL)
- i. Underwriters Laboratories Inc. (UL)
- j. Institute for Electrical and Electronics Engineers (IEEE)
- k. Physical Security Interoperability Alliance (PSIA)
- l. Open Network Video Interface Forum (ONVIF)
- m. American National Standards Institute (ANSI)
- n. Uniform Building Code (UBC)
- o. National Electrical Code (NEC)
- p. National Electrical Safety Code (NESC)
- q. National Fire Protection Code (NFPA)
- r. National Electrical Manufacturers Association (NEMA)
- s. Occupational Safety and Health Administration (OSHA)
- t. Environmental Protection Agency (EPA)
- u. Building Industry Consulting Services International (BICSI)
- v. All other federal, state and local codes and ordinances that may prevail.
- w. Industry IoT Consortium Security Maturity Model (IoT SMM)

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination

- 1. Prior to installing the Bosch Video Management Software BVMS (i.e Operator Client) on any District owned PC, Technology Department shall be notified for release of required IP Addresses or FQDN and permission to proceed. District Representative will send Contractor an IP request form, which can take up to a week to process once filled out and returned.

B. Pre-installation Meetings

- 1. Schedule a pre-installation meeting with DISTRICT REPRESENTATIVE and CONTRACTOR in attendance.

C. Sequencing and Scheduling

- 1. CONTRACTOR shall review the construction and completion schedules and shall coordinate execution of the work as defined in the Contract Documents with all other contractors and service providers engaged by LBUSD and their representatives for the work.

1.04 SUBMITTALS

A. Requirements

- 1. Submit under provisions of Section 01 33 00 – Submittals.
- 2. Contractor is to submit the following prior to construction for review:

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- a. Product Data
 - b. Shop Drawings
 - c. Qualification Statement
 - d. Construction Schedule
 - e. Training Schedule
- B. Product Data
 - 1. Digital Video Surveillance System Manufacturer's data, user and installation manuals for all equipment and software programs including computer equipment and other equipment required for complete video management system.
 - 2. SCCS Manufactures' data, refer to Section 27 10 00 submittal requirements.
- C. Shop Drawings
 - 1. Provide complete electrical installation drawings (shop drawings) showing wiring, pathways, identification of cable, panel, equipment (active and inactive) IP addresses, and all associated equipment, layout and location of all surveillance, signaling devices, control panels and electrical supply panels for power connections to system. The Contractor shall also show location of, and connection to, all other devices and equipment which are included in the complete function of the surveillance system as specified herein, included will be Single Line diagrams, and Matrixes, prior to construction for district approval. SCCS shop drawings, refer to specification Section 27 10 00. See Attachments for sample close out forms.
 - 2. Provide complete point-to-point wiring diagrams showing the points of connection and terminals used for all electrical connections in the system, including internal wiring diagrams of all equipment.
 - 3. SCCS Shop Drawing, Refer to specification 27 10 00 submittal requirements.
- D. Qualification Statement
 - 1. CONTRACTOR must be certified with Bosch and be BVMS Technical Certified.
 - 2. Provide installer's experience and qualifications, which shall include three (3) years of projects of similar complexity. Include names and locations of two projects successfully completed using similar technology.
 - 3. Provide documentation stating you have been in the telecommunication contracting business for a minimum of five (5) years under the same name and are located within a four (4) hour response time of the District.
 - 4. Provide certification of the certified installer for this project.
 - 5. Provide complete instructions on correct operation of system to personnel designated by the OWNER. All instructions shall be coordinated with the DISTRICT REPRESENTATIVE. CONTRACTOR shall send a confirming letter to the DISTRICT REPRESENTATIVE giving date of instruction and names of District's personnel who were instructed.
 - 6. SCCS, Refer to specification 27 10 00 submittal requirements.
- E. Construction Schedule

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1. Initial schedule to be provided showing project completion within project deadlines as indicated in contract.
2. Updates and a two week look ahead to be provided on a weekly basis showing current status of work.
3. The contractor will use an electronic project management software compatible with Microsoft Project.

F. Training Requirement

1. Contractor to provide training to District staff.
 - a. Conduct user training with site staff upon completion of each site.
 - b. Provide training to District Technology Branch for system support.
 - c. Provide training to School Safety personnel to manage analytics.
 - d. Record all training sessions and turn copy of recording over to District as part of close out.
 - e. Bring a sign in sheet to all training events and have attendees sign in. Provide copies of sign in sheets as part of close out documents for proof of training.

1.05 CLOSEOUT SUBMITTALS

A. Submit all draft submittals in electronic form to DISTRICT REPRESENTATIVE for review and approval prior to Beneficial Completion and final submittal prior to Contract Completion. DISTRICT reserves the right to reject all submittals should it not meet the Contract Documents. Some templates are provided in the Attachments. Contractor is responsible for providing all of the following information, even if this does not appear in the provided templates:

1. User manuals.
2. Parts list.
3. Record Documentation.
4. Bosch Project Assistant Report
5. Equipment Schedule and Network Information
 - a. OWNER will provide Excel template to CONTRACTOR to complete and submit electronic copy of equipment schedule, which includes the following:
 - i. Camera
 - a) Type/Model
 - b) Camera MAC Address
 - c) Camera IP address
 - d) Building location
 - e) Field-of View
 - f) IDF cabinet (IDF name/ID, Building, Room)
 - g) Switch name
 - h) Switch IP address
 - i) Switch port number
 - ii. Divar and Transcoder

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- a) Type/Model
 - b) Divar MAC Address
 - c) Divar IP Address
 - d) Switch name
 - e) Switch IP address
 - f) Switch port number
- 6. System device locations on electrical floor plans.
- 7. Wiring and connection diagram.
- 8. Warranty Documentation.
- 9. Operating and maintenance manuals.
 - a. A statement of guarantee including date of termination and the name and phone number of the person to be called in the event of equipment failure. Including 24-four hour technical assistance program from Bosch.
 - b. Complete record drawings of wiring, pathways, identification of cable, panel, equipment (active and inactive) IP addresses, and all associated equipment. Included will be Single Line diagrams, Matrixes, similar to submittal drawings.
 - c. Detailed catalog data on all installed system components. Include a spare parts list.
 - d. Copy of the test reports.

1.06 QUALITY ASSURANCE

A. Video Surveillance System Qualifications:

- 1. Listed by UL specifically for the required loads. Provide evidence of compliance upon request.
- 2. All equipment shall be new, completely factory assembled, wired and tested and shall be in conformance with NEC and UL. All systems and components shall have been thoroughly tested and proved in actual use.
- 3. Components contained in protective surveillance system shall be conservatively rated [i.e., safety or overload factor of at least fifty percent (50%)] with respect to performance characteristics.
- 4. The BVMS software shall be installed by a Bosch certified dealer/integrator that is BVMS certified. Certification for installation shall be conducted by Bosch/LBUSD and shall provide all necessary knowledge to fulfill the systemization and deployment across diverse networks and infrastructures, as well as provide commissioning abilities at the integrator level.
- 5. Exposed surfaces of devices and other items of equipment shall be provided with suitable corrosion resistant finish. Surface finish shall be of one (1) color throughout of manufacturer's standard unless otherwise specified.
- 6. Equipment shall be provided with tamper proof technology, initiating an alarm signal when unit is vandalized or removed from service.

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7. System and its components shall be designed and installed to ensure loss of system power results in Network Video Recorder (NVR) and Bosch Video Management System (BVMS) remaining stable, reliable, with continuous operation for time on Uninterruptable Power Supply (UPS) and auto shutdown sequence initiated (smart UPS) if outage exceeds time limit of batteries. CONTRACTOR shall guarantee 7 minutes of up-time on Divar systems and additional run-time for safe auto shutdown.

B. Contractor/Installer Qualifications:

1. All equipment and systems specified in this Section shall be provided and installed by a single Special Systems contractor who will be responsible for proper operation of this system.
2. The Contractor shall be a Bosch-certified installer (BVMS Certified) and properly trained by Bosch to install, modify, and service, the specified systems and equipment.
3. The Contractor shall have a B or C10 and C7 license.
4. The BVMS software shall be installed by a Bosch certified dealer/integrator. Certification for installation shall be conducted by Bosch and shall provide all necessary knowledge to fulfill the systemization and deployment across diverse networks and infrastructures, as well as provide commissioning abilities at the integrator level.
5. Work and related materials shall meet or exceed the requirements of the rules and regulations of the state of California, NFPA, Cal-OSHA, BICSI, and NECA – “Standards of Installation”. Installation showing evidence of poor workmanship or not in accordance with this Specification or the Drawings shall be re-accomplished or repaired to the satisfaction of the District’s Representative at the Contractors expense.
6. The Contractor shall adhere to lead safety work practices where applicable.
7. The Contractor shall have a service facility and organization with staffing capable of providing comprehensive maintenance and service for the specified system within a 100 mile radius of the project.
8. The Contractor shall provide Bosch-certified technicians. Certified technicians shall install and supervise installation, commissioning, and maintenance of the work.
9. All installing personnel shall be licensed as required by local and/or state jurisdictions.
10. The Contractor shall have a minimum of (5) five years’ experience in the installation of Digital Video Surveillance Systems of similar complexity as specified herein.
11. The Contractor shall ensure compliance with and have a thorough understanding of all local codes and contract conditions pertaining to the Work.
12. The Contractor shall have local in-house engineering and project management capabilities consistent with the requirement of the work. The Contractor shall provide a team managed by a project manager responsible for submittals, installation, scheduling, manpower, testing, record documents, subcontractors, final acceptance, warranties, etc.
13. By submitting a Proposal, the Contractor certifies that it is qualified in all areas pertaining to the Work. In the event the Contractor becomes unable to complete the Work in accordance with the Contract Documents, or the satisfaction of the Owner or its representatives due to a lack of understanding of the equipment, system, or services required by the Contract Documents, the Contractor shall retain the services of the applicable manufacturer’s representatives to expeditiously complete the Work in accordance with the construction schedule at no additional cost to the Owner.

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14. Bidders shall submit documentation with the Proposal as required to demonstrate compliance with Contractor Qualifications. References shall include contact information for end users familiar with the installation and continued operation of the systems, and the Contractor's work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials identified by District Technology Representative to the district for inventory and asset tagging. Specifically all Divars and UPS must be asset tagged. All materials must be in manufacturer's original, unopened, undamaged containers; and unharmed original identification labels.
- B. Protect stored materials from environmental and temperature conditions following manufacturer's instructions.
- C. Handle and operate products and systems according to manufacturer's instructions.

1.08 WARRANTY

- A. Manufacturer's Warranty:
1. Provide a Bosch **five (5) year** manufacturer's warranty covering 3 years for replacement and repair of defective equipment.
- B. System Warranty:
1. Provide a five (5) **year** warranty for the work (System Warranty). The warranty shall begin after acceptance of the Work by the Owner or the District's Representative.
2. If, within Five (5) **years** after the date of final acceptance of the work or within such longer period of time as may be prescribed by law, or by the terms of any applicable special warranty required by the Contract Documents or provided by Bosch, any of the Work or equipment is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly including all parts and labor after receipt of notice from the Owner to do so unless the Owner or its representative has previously given the Contractor a written acceptance of such conditions. This obligation shall survive termination of the Contract. The Owners representative shall furnish such notice either verbally or in writing.
3. Nothing contained in the Contract Documents shall be construed to establish a shorter period of limitations with respect to any other obligations which the Contractor might have under the Contract Documents or any manufacturer's warranty.
4. The establishment of the time period of five (5) **years** after the date of final acceptance of the Work or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents, relates only to the specific obligations of the Contractor to correct the work or equipment, and has no relationship to the time within which its obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to its obligation other than specifically to correct the Work or equipment.
5. Furnish written notice to the Owner documenting any Work performed during the warranty period, including any preventive maintenance Work performed.
6. The Owner reserves the right to expand or add to the system during the warranty period using firm(s) other than the Contractor for such expansion without affecting the Contractor's responsibilities, provided that the expansion is done by a firm which in an

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authorized dealer /installer or agent for the equipment or system being expanded. Contractor shall not be responsible for maintenance of equipment installed by other firms.

7. In addition, the Contractor shall be responsible for the administration of manufacturers' equipment warranties that exceed the 3 year system warranty.

PART 2 – PRODUCTS

Reference Appendix for matrix of District approved Bosch security cameras with the model, usage and lens recommendations.

2.01 OWNER FURNISHED CONTRACTOR INSTALLED

A. Existing

1. The District reserves the right to repurpose existing cameras from other areas and provide these existing cameras as OFCI to CONTRACTOR in exchange for a credit.
2. CONTRACTOR shall update existing camera maps within BVMS software to reflect most recent site and camera conditions. CONTRACTOR is required to update background of map to reflect new building and site conditions.

2.02 MANUFACTURER

- A. Bosch Security Systems, Inc., <https://commerce.boshsecurity.com/us/en/Product/c/1>
- B. No substitutions are permitted – District Board Approved Standard.

2.03 SOFTWARE SERVICE AGREEMENT (SSA)

- A. Contractor to provide a “Perpetual” Software Service Agreement (P-SSA) for all sites in scope. (designated with a FM in Bosch part number)

2.04 DIGITALVIDEO SURVEILLANCE SYSTEM, REMOTE DEVICES

- A. Unless otherwise indicated on drawings standard static outdoor camera shall be Bosch Model NDE-8XXX series fixed Dome Camera with appropriate lens (4mm-40mm) as indicated:
 1. Bosch # NIN-73023-A3AS (3mm-9mm lens) for wide coverage of an area or current version.
 2. Bosch # NIN-73023-A10AS (10mm-23mm lens) for long narrow or zoomed in views or current version.
- B. For each camera adhere to the following requirements:
 - a. Clearly label camera with camera number visible from the ground-view.
 - b. Provide the following accessories as indicated on the drawings:
 - c. NDA-8000-PIPW Pendant interface plate indoor/outdoor. Pendant arm mount, see section D below for acceptable pendant arm mounts.
 - d. Provide the following Software Options for each camera:
 - i. IVA 6.5 software License, BVMS Channel (CAM/DEC) Expansion. Free Maintenance, Bosch # MBV-XCHANPRO-FM or current version

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- ii.
- C. Unless otherwise indicated in the drawings, the standard indoor camera will be NUV-3702-F02-FLEXIDOME Micro 3100i Indoor-2MP HDR 137 degree 1080P HD resolution, EDN, 2.49 mm F1.7 Lens; UW-FOV, IDNR; ROI, Motion+, Micro SDXC Slot, IK08 Vandal-Resistant, Indoor/Outdoor, POE. Do not use for outdoor scenarios without written approval or unless drawings/contracts indicate this model.
 - 1. Clearly label camera with camera number visible from the ground-view
 - 2. Provide the following Software Options:
 - a. IVA 6.5 software License, BVMS Channel (CAM/DEC) Expansion. Free Maintenance, Bosch # MBV-XCHANPRO-FM or current version
- D. Unless otherwise indicated on drawings standard Panoramic camera is Bosch Model Flexidome panoramic 5100i IR model: NDS-5704-F360LE, F360LE-GOV.
 - 1. Install camera where drawings indicate, generally for pendant or ceiling mount applications in large open areas. Configure in ceiling mount position.
 - 2. Install where drawings indicate, generally for wall mount scenarios or scenarios in corridors. Configure in wall mount position. Use NDA-5080-TM when necessary.
 - 3. Provide the following Software Options:
 - a. IVA 6.5 software License, BVMS Channel (CAM/DEC) Expansion. Free Maintenance, Bosch # MBV-XCHAN-FMPRO or current version
- E. Unless otherwise indicated on drawings standard Pan Tilt Zoom camera is Bosch Model FLEXIDOME multi 7000i camera as indicated on drawings:
 - 1. Bosch # NDM-7703-A fixed dome 10MP 3.7-7.7mm IP66
 - a. Clearly label camera with camera number visible from the ground-view
 - b. Provide the following accessories as indicated on the drawings and/or as required for a functional system:
 - i. 24 VAC Power Supply Unit, Bosch VG4-A-PSUO
 - ii. 120 VAC Power Supply Unit, Bosch VG4-A-PSU1
 - iii. 230 VAC Power Supply Unit, Bosch VG4-A-PSU2
 - iv. Fiber Optic Ethernet Media Converter Kit, Bosch VG4-SFPSCKT – District preference is to avoid using these if a copper connection is possible.
 - v. Clear high-resolution acrylic bubble, Bosch # VGA-BUBBLE-PCLA
 - vi. Tinted high-resolution acrylic bubble, Bosch # VGA-BUBBLE-PTIA
 - vii. Pipe mount white, Bosch # VG4-A-9543
 - viii. Pendant arm mount with supply box 24 VAC white, Bosch # VG4-A-PA0
 - ix. Pendant arm mount with 120 VAC transformer white, Bosch # VG4-A-PA1
 - x. Pendant arm mount with 230 VAC transformer white, Bosch # VG4-A-PA2

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- xi. Pendant arm with wiring / without power supply box white, Bosch # VGA-PEND-ARM
- xii. Pendant arm mounting plate for use with VGA-PEND-ARM white, Bosch # VGA-PEND-WPLATE
- xiii. Roof parapet mount (VG4-A-9543 Pipe Mount Cap required) Bosch VG4-ROOF-MOUNT
- xiv. Trim skirt for AutoDome power supply box, white Bosch # VG4-A-TSKIRT
- xv. Flat Roof Adapter for Parapet Mount, Bosch # LTC 9230/01
- xvi. Corner Mounting Plate for arm mount, Bosch VG4-A-9542
- xvii. Mast (Pole) Mounting Plate for arm mount, Bosch VG4-A-9541
- xviii. Cover for AutoDome Power Supply Boxes, Bosch VGA-SBOX-COVER
- xix. High PoE Midspan 60W, single port, AC in, Bosch NPD-6001A. District preference is to avoid using these if alternatives are possible.

2. Provide the following Software Options:

- a. IVA 6.5 software License, BVMS Channel (CAM/DEC) Expansion. Free Maintenance, Bosch # MBV-XCHAN-FMPRO or current version

D. Provide Bosch Video Transcoders (built into the Divars).

E. Registration of each Bosch camera into Bosch Remote Portal.

2.05 DIGITAL VIDEO SURVEILLANCE, IP VIDEO STORAGE

- A. Provide Bosch All-in-one recording management solution (4x18TB storage) DIVAR IP DIP-644IIG-4HD, as indicated on the drawings. Divar shall be Raid 5 . This model will be used primarily in High Schools.
- B. Provide/configure one new Bosch DIVAR per site. Divar type shall be determined by school type unless otherwise specified. For Elementary and miscellaneous (other) schools furnish (4x 18TB storage) DIVAR IP configured in Raid 5. For K-8 schools and Middle schools furnish (4x 18TB storage) DIVAR IP DIP-644IIG-4hd and configure in Raid 5.
- C. Divar must accommodate 30 days of video with recorded resolution at highest possible for each camera and frame rate of 15 fps at Bitrate Optimized Standard Profile with Metadata Collection Activated. If the installation of additional cameras in scope will take the system outside of these parameters Contractor shall submit a RFI on how to proceed.
- D. Provide Bosch appropriately sized, hot swappable spare drive per storage array. Provide spare hard drives at a ratio of 15 % compared to divar quantity. This number will be rounded up to the nearest whole number. For example if 62 divars are installed, provide 10 of the following accessory:
 - 1. 8TB HDD – DIP-AIO18-HDD
- E. Provide, install, and configure programming for a Bosch Approved Micro SD card at each camera for storage redundancy/fail over. Retention goal per SD card on camera is 7 days.

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2.06 DIGITAL VIDEO SURVEILLANCE SYSTEM, INTELLIGENT VIDEO ANALYSIS (IVA)

A. Provide Bosch Intelligent Video Analysis as indicated on the drawings and specifications:

1. IVA Triggers/Alarms to be configured at each PTZ camera and cameras with IVA as indicated on the drawings:
 - a. Line crossing
 - b. Loitering
 - c. Idle object
 - d. Removed object
 - e. Condition change
 - f. Trajectory tracking
 - g. Filters
 - h. Image Stabilization
 - i. Thermal camera support
 - j. Tamper detection.

B. System Architecture

1. The system will be comprised of IP cameras and encoders with video content analysis capability built into the device.
2. It will not require any additional hardware, such as PC's or Analysis Servers, to perform the video content analysis.
3. The failure of a single or multi-channel VCA device will only result in the loss of content analysis for that one device. All other VCA devices will continue to operate and provide video content analysis.
4. Each IP camera or encoder will contain its own set of rules for VCA detection. The user will be able to configure the rules. It will be possible to upload the configuration file locally or centrally to a PC for backup.
5. Each IP camera or encoder will embed the VCA data in the form of metadata and transmit it together with the video. The video and metadata will be stored together.
6. The design of the system will make expansion of VCA capability to other cameras or encoders simple. All IP cameras and encoders installed in the system will be equipped with VCA capability; it will only be required to input a license string to the device, via internet browser or configuration software, to enable the feature. Systems that require additional equipment, such as PC's or Analysis Servers, will not be acceptable.

2.07 DIGITAL VIDEO SURVEILLANCE SYSTEM, MANAGEMENT SYSTEM

A. Tie into existing Bosch Enterprise-Class Bosch Video Management Pro System (BVMS)

1. Version: 6.5 (verify with the Bosch representative and the District's Technology representative prior to ordering)
2. All licenses provided must be FM type, and/or compatible across any version of BVMS. Provide the following software and licensing required for the lifetime maintenance of the system:

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- a. BVMS CHANNEL (CAM/DEC) EXPAN. FREE MAINT., Bosch # MBV-XCHANPRO-FM - Quantity 1 per camera/encoder/decoder device.
 - b. MBV-XWST-FMPRO, Bosch # MBV-XWSTPRO-FM – Quantity 2 per site unless otherwise specified.
3. District Representative may facilitate access to a Configuration Client admin account by logging into an existing admin account or District Representative may create an account for Contractor usage. This will be determined by the scope of the camera work and is dependent on approval from District School Safety (Owner).

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verification of conditions

1. Examine areas to receive devices and notify adverse conditions affecting installation or subsequent operation.
2. Do not begin installation until unacceptable conditions are corrected.
3. CONTRACTOR to assess all pathway and determine the best pathway to pull the cable. Limit the amount of exposed conduit runs if the ability to run cable above ceiling spaces, hatch spaces, or in areas less exposed exists. CONTRACTOR to coordinate field walk with DISTRICT REPRESENTATIVE to determine best pathway and if pathway requires excessive exposed conduit runs.

3.02 PREPARATION

A. Demo / Removal

1. N/A

3.03 INSTALLATION

A. System description and scope of work

1. Workmanship on the installed system shall be of professional quality, best commercial practice, and accomplished by persons experienced in the techniques and standards of the Digital Video surveillance system industry.
2. The work under this section includes all final design, all labor, material, equipment, licenses, hardware, software, supplies, testing, and accessories required to furnish and install a complete District-wide enterprise level Video IP Surveillance system (also referred to as closed circuit television-CCTV) as indicated on the plan drawings and as specified herein. Work also includes all electrical power and conduit requirements, surveillance recording signage as may be required by local and/or state jurisdiction, and coordination with all other contractors and/or District IS personal for a complete turnkey system.
3. CONTRACTOR is responsible to provide and fully configure all system hardware, software, firmware, including video workstations and monitors, storage servers, BVMS software, camera options, lens focal points, camera field of view, system interfaces, for both on-site and off-site locations to the satisfaction of the District.
4. CONTRACTOR shall provide and install IP video cameras at the locations indicated on the bid documents. CONTRACTOR shall adjust camera's field of view and focal point as

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indicated on the bid documents. The District reserves the right to modify these requirements during construction. Prior to final acceptance by the District, the Contractor shall adjust all fields of view and focal points to the satisfaction of the District at no additional cost.

5. Power over Ethernet (PoE) network switches are external to this work and are not included in this scope of work. CONTRACTOR is responsible for the coordination of required changes to network configurations with DISTRICT REPRESENTATIVE.
 - a. Prior to connecting any camera cabling, CONTRACTOR to provide port information on the switch that the camera will be connected to for VLAN configuration. This information will include but not limited to the following:
 - i. Camera number
 - ii. Camera Mac address
 - iii. Switch Name
 - iv. IP address of Switch
 - v. Mac address of Switch
 - vi. Port number
6. CONTRACTOR shall provide and fully configure all video analytics (IVA) for the cameras as specified on the bid documents. CONTRACTOR shall coordinate with District to determine the required IVA parameters for each IVA required camera and be responsible for all IVA programming. CONTRACTOR shall meet with the DISTRICT REPRESENTATIVE approximately seven (7) days after final system acceptance to review, adjust and reconfigure IVA parameters as required, at no additional cost to the District.
7. CONTRACTOR shall meet with District personnel to determine system wide access levels and rights for specific users on each campus.
8. CONTRACTOR shall not install any technician or contractor passwords on any device on the system. CONTRACTOR shall provide all system login passwords to the District prior to final acceptance. CONTRACTOR shall not use manufacture default password in the system but will coordinate with District for acceptable password.
9. CONTRACTOR shall provide all required licenses for a complete and fully functional system.
10. CONTRACTOR to install video storage server and transcoder including all required mounting materials to the existing MDF rack if space permits. Verify final location with DISTRICT REPRESENTATIVE. All security camera gear, including dedicated UPS/battery shall be placed in the same rack if possible. CONTRACTOR to submit rack elevation.
11. CONTRACTOR shall install and connect UPS and Battery with SNMP Webcard to MDF rack and connect CCTV storage unit to UPS. CONTRACTOR shall connect network cabling to local network switch as required.
12. CONTRACTOR to connect storage server equipment to UPS. CONTRACTOR to install and configure Tripplite “PowerAlert Network Shutdown Agent” or compatible in storage server operating system to correspond with UPS. Configure to provide minimum of seven

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(7) minute run-time in addition to enough time for graceful shutdown in the event of a power outage.

13. CONTRACTOR is responsible to properly size the total storage required based on total cameras, bit rates, frame rates, days of retention, etcetera. Contractor shall include an additional 15% available storage capacity for future cameras. The following shall be included in the Contractor's final storage calculations:
- a. camera quantity
 - b. minimum bit rate per camera frame
 - c. 24-hour recording, 40% motion
 - d. frames per second when motion is detected (see camera schedule on plans)
 - e. verification frame recorded during no motion (see camera schedule on plans)
 - f. MPEG4 or H.264(ISO/IEC14496-10) compression rate
 - g. number of days retention before overwrite (see camera schedule on plans)
- B. At the Communications Center located in the LBUSD District Office building and at School Safety Office located in the Emergency Operations Center, the CONTRACTOR shall confirm that all cameras are configured and viewable through the existing BVMS system.
- C. CONTRACTOR shall be responsible for obtaining and utilizing the latest Video Surveillance System (CCTV), Structured Cabling, Architectural, and Electrical plan drawings for this project.
- D. CONTRACTOR shall be responsible to program and configure the Bosch video recording management software (BVMS) package to the satisfaction of the District.
- E. During the installation process and for the duration of the project schedule, if there are new requirements for software update, CONTRACTOR will provide latest version to the new equipment and existing equipment. This includes but not limited to firmware updates on all new and existing cameras, storage units, and software system updates.
- F. CONTRACTOR shall schedule with the DISTRICT REPRESENTATIVE for a final system verification and programming review when complete at each site. Contractor shall schedule with DISTRICT REPRESENTATIVE a minimum of two (2) weeks prior to anticipated site completion. The Contractor shall resolve any punch list items created at this time prior to final acceptance by the District.
- G. CONTRACTOR shall provide system training to personnel designated by the District prior to final acceptance. CONTRACTOR shall coordinate with District's schedule.
- H. CONTRACTOR shall reference all bid documents, and system block diagrams for additional requirements.
- I. Communications of cameras summary:
1. Refer to Section 27 10 00.
 2. Connectivity/Cabling solution for IP cameras

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- a. All cabling, wiring, and associated cabling components, shall be yellow for the Digital Video Surveillance System.
- b. Route cabling from camera location to nearest IDF all cabling/wiring shall be run in continuous lengths between the MDF/IDF's to the cameras and equipment, no splicing permitted.
- c. Connectors at camera are to be 8P8C (RJ45) female jacks, installed in a 1 port surface mount box (white) with in the building.
- d. Provide (1) Yellow Cat.6 patch cord from the surface mount box to the camera, Contractor to verify length prior to ordering. Category and manufacture of patch cord to match cabling infrastructure.
- e. Provide (1) Yellow Cat.6 patch cord on MDF/IDF side per camera, Contractor to verify length prior to ordering. Category and manufacture of patch cord to match cabling infrastructure.
- f. Terminate at the MDF/IDF on existing or new patch panels.
 - i. Where new patch panels are to be installed, install 1:1 wire manager to patch panel.
 - ii. All new patch panels are to be 48 port unless otherwise noted. Wire managers are to be 2 rmu unless otherwise noted.
 - iii. All cables running to patch panel should be labeled/named at the patch panel.
 - iv. All cable at terminating ends should have a wrap-around label indicating the equipment/device it is connected to and should reflect the same name on the patch panel.
- g. UTP Category 6 Yellow
 - i. Systimax and AMP Net Connect to match existing conditions at each site.
 - ii. Or Hubbell-Premise with Hubbell-Premise Existing Conditions Warrantee Acceptance Letter of approval, for all sites.
- h. OM4 cabling
 - i. Corning or equal
- i. Connectivity/Cabling solution for analog cameras (only for use when integrating an access control system with a callbox camera, otherwise all cameras must be Bosch and digital).
 - i. RG 6 quad shield coax cabling.
- j. Special care shall be taken to insure proper slack or loops being left in junction boxes.
- k. Surveillance system contractor shall check drawings for adequacy of wiring system and include in amount all additional wiring necessary for system proposed and actually installed.

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- J. Prior to installing the Bosch Video Management Software BVMS on any District owned PC, LBUSD Technology Department shall be notified for release of required IP Addresses, FQDN, and permission to proceed. Contact District Representative to coordinate this.
- K. Install devices in accordance with manufacturer's and engineer's instruction at locations indicated on the drawings.
1. Ensure selected location is secure and offers protection from accidental damage.
 2. Location must provide reasonable temperature and humidity conditions, free from sources of electrical and electromagnetic interference.
 3. Install cameras with 96" minimum clear space below cameras and their mounting. If required submit a RFI to change elevation or type of mounting to achieve required clearance.
- L. Surveillance System coverage areas:
1. Refer to drawings for camera locations. Final selection for placement will be accomplished through a walk-through with DISTRICT REPRESENTATIVE. If cameras are installed without a prior walkthrough or direction from DISTRICT REPRESENTATIVE Contractor will be liable for any camera relocations identified as necessary.
 2. Digital/Virtual masking of private, residential/business areas from the camera's screen shot is required.
 3. Configuration of Intelligent Video Analysis.
- M. Intelligent Video Analysis (IVA) provide the most current version of IVA at all PTZ cameras, and cameras with IVA as indicated on the drawings:
1. Configuration of the IVA Intelligent Tracking in IVA Trigger mode for all Bosch PTZ cameras, IVA Triggers/Alarms to be configured at each PTZ camera:
 - a. Line crossing
 - b. Loitering
 - c. Idle object
 - d. Removed object
 - e. Condition change
 - f. Trajectory tracking
 - g. Filters
 - h. Image Stabilization
 - i. Thermal camera support
 2. Configuration of the IVA Trigger/Alarms for all Bosch cameras with IVA as indicated on the drawings, Triggers/Alarms to be configured:
 - a. Loitering
 - b. Idle object

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- c. Removed object
 - d. Condition change
 - e. Trajectory tracking
 - f. Filters
 - g. Image Stabilization
 - h. Thermal camera support
- N. Bosch Enterprise-Class Bosch Video Management System (BVMS Professional) provide the most current version (verify with the Bosch representative and the District's Technology representative prior to ordering)
- 1. Configuration of the Bosch BVMS shall include but not limited to:
 - a. Mobile video service
 - b. Mobile app
 - c. Web client
 - d. Remote access via public networks
 - e. Automatic scan of IP devices
 - f. Automatic IP address assignment of IP devices
 - g. Batch firmware updates of IP devices
 - h. Configurable Logical Tree
 - i. Pre-configured camera sequence
 - j. Automatic Sequences
 - k. Configurable user-events
 - l. Server look up
 - m. Zoomable site maps with links, devices, sequences, and command scripts
 - n. Automatic map positioning of cameras in a map when a camera is selected
 - o. Site maps in DWF format
 - p. VideoTec DCZ keyboard support
 - q. Bosch Intuikey keyboard support
 - r. Flexible image panes allowing any combination of video window size and layouts
 - s. Any live image pane can be switched to instant playback
 - t. Multiple instant playback
 - u. Image windows can display live video, instant playback video, text documents, maps, or webpages.
 - v. Device states shown by icon
 - w. Favorites tree
 - x. Bookmarks

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- y. Intelligent Video analysis (IVA)
- z. Configure into the LBUSD LDAP
- aa. Logical Tree
- bb. User group rights
- cc. Logbook access
- dd. Priority Assignment's for PTZs
- ee. Dual Authorization log on
- ff. System wide health monitoring
- gg. Network equipment and 3rd party device monitoring with SNMP
- hh. Recording schedules for holidays, and Non-student days
- ii. Compound event recording
- jj. Event duplication
- kk. Event allocation
- ll. Schedule dependent event-generated command script invocation, event logging
- mm. Alarm Handling schedule dependent alarm generation
- nn. Alarms trigger alarm-mode recording for any camera
- oo. Alarm priorities
- pp. Selective auto-popup on alarm
- qq. Alarms display in separate alarm window
- rr. Image pane per alarm with live or playback video, site maps, documents, or web pages displayed in an "alarm row", with the highest priority alarms on top
- ss. Auto file per alarm
- tt. Workflow with user instructions and user comments, optionally forced before clearing
- uu. Alarm auto clear options either time or state

3.04 RE-INSTALLATION

- A. The CONTRACTOR may be asked to re-install a used camera from the site in exchange for a credit at any time prior to final approval of submittals. See OFCI section.

3.05 FIELD QUALITY CONTROL

- A. Test proper operation of all video system devices.
- B. Determine and report all problems to Bosch's customer service department.
- C. Work and related materials shall meet or exceed the requirements of the rules and regulations of the state of California, NFPA, Cal-OSHA, BICSI, and NECA – "Standards of Installation". Installation showing evidence of poor workmanship or not in accordance with this Specification or the Drawings shall be re-accomplished or repaired to the satisfaction of the District's Representative at the Contractor's expense.

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3.06 SYSTEM STARTUP / COMMISSIONING

- A. Require complete system testing, 4 hour storage redundancy testing and commissioning including post occupancy reviews and final testing prior to expiration of warranty.
- B. Require network configurations of new network equipment provided for the Digital Video Surveillance System, and coordination with data communications contractors on all existing network equipment.
- C. Test complete system in presence of District Representative, District Technology Representative, and District Maintenance and Operations personnel.

3.07 ADJUSTING

- A. Make proper adjustment to video system devices for correct operation in accordance with manufacturer's instructions, and district approval.
- B. Make any adjustment of camera settings to comply with specific customer's need.
- C. Occupancy Adjustments: When requested within 32 months of the date of substantial completion, provide up to four (4) on-site visits for each site for assistance in adjusting system to suit actual occupied conditions and to optimize performance of the installed equipment, reference 3.9.A Attachments "System Tuning & Adjustment." Tasks shall include, but are not limited to, the following:
 - 1. Check cable connection
 - 2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed
 - 3. Adjust all preset positions; consult District Technology representative.
 - 4. Adjust camera views as needed: consult District Technology representative.

3.08 CLOSEOUT ACTIVITIES

- A. Demonstration
 - 1. Train Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.
 - 2. Provide to District the training agenda prior to commencing any training.
- B. Proof of system performance and acceptance testing
 - 1. Upon completion of the system installation, it shall be the responsibility of the CONTRACTOR to perform the necessary testing and any adjustments to insure proper system operation in accordance with the Contract Documents.
 - 2. The system shall be physically inspected by the DISTRICT REPRESENTATIVE to assure that all equipment is installed in a neat and workmanlike manner as called for by the plans and specifications.
 - 3. CONTRACTOR shall conduct an operating test to verify proper performance of the system. The system shall be demonstrated to operate in accordance with the requirements of these specifications. The test shall be performed in the presence of the DISTRICT REPRESENTATIVE. CONTRACTOR shall furnish all equipment and personal required for the tests.

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4. Should such a demonstration of performance show that the CONTRACTOR has not properly installed the system, CONTRACTOR shall make all necessary changes or adjustments at no cost to LBUSD and a second performance demonstration will be arranged with the DISTRICT REPRESENTATIVE at the CONTRACTOR'S expense. (Including per diem cost for the participating personal.)
5. Should a second performance demonstration fail, CONTRACTOR agrees to correct the system deficiencies under the supervision of the DISTRICT REPRESENTATIVE at no cost to LBUSD.

C. Training

1. Prior to establishing a training schedule, CONTRACTOR will verify operational status of system with DISTRICT REPRESENTATIVE.
2. District personnel will be trained in the operation of the surveillance system by the CONTRACTOR'S factory authorized trainers, scheduled and coordinated by the CONTRACTOR.
3. Training will be performed both in the system with the Mouse and through their individual web browser at their desks.

3.09 ATTACHMENTS

A. Additional CCTV Scope of Work (SOW):

1. Install Divar, and UPS in Server cabinet or other cabinet with available rack unit space that is agreed upon with District representative—Configure DIVAR to have a minimum of seven (7) minutes of run-time and sufficient power to sustain a graceful shutdown. Install “Tripplite PowerAlert Network Shutdown Agent” or compatible into storage server operating system to correspond with UPS. Coordinate with DISTRICT REPRESENTATIVE prior to commencing work. CONTRACTOR'S coordination to include all necessary equipment including but not limited to cable, patch cords, terminations, panels, miscellaneous equipment, testing, etcetera for a complete and operable system.
2. Coordinate with District to have existing LAN core switches reconfigured as required to facilitate new Bosch equipment. If it is determined that a switch needs to be relocated to accommodate the security camera equipment CONTRACTOR shall be prepared to work night shift during a predetermined maintenance window at no additional cost to District.
3. CONTRACTOR to provide 120vac duplex electrical outlet under District's direction. Provide surface mounted box and homerun 3#12, 1#12G to nearest 120v panel and connect to spare circuit breaker or provide new 20A, 1P circuit breaker in existing panel space for connection of new receptacle. New circuit breaker characteristics to match those of existing in panel. Homerun metallic single channel Wiremold series-700 (or equal) in finished areas, ½” conduit acceptable in non-finish spaces only-

B. In addition to the above summary where applicable CONTRACTOR shall include the below requirements in the scope of work:

1. Contractor shall obtain static IP address from District to allow viewing across the District LAN and WAN. Coordinate through DISTRICT REPRESENTATIVE prior to making connections to the District's LAN/WAN.
2. CONTRACTOR shall be responsible to remove and reconfigure all patch cords and cables in IDF/MDF rooms as required to provide for complete system

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connectivity and proper system operation. Provide additional cables, patch cords, hardware and fasteners as may be required.

3. CONTRACTOR shall provide, install, program, optimally configure and make operational all components, system and devices involved as described in this scope of work to the satisfaction of the District's Representative.
4. Label all cameras, cables, patch panels, servers and workstations with machine generated labels. Camera labels shall include MAC address number. Hand written labels are prohibited. Provide DISTRICT REPRESENTATIVE with sample labeling plan for review and approval prior to labeling all equipment.
5. Two (2) weeks prior to completion of system programming, CONTRACTOR shall schedule a programming review and sign-off with the DISTRICT REPRESENTATIVE. Punch list items created at this time must be resolved prior to final acceptance at each site.
6. CONTRACTOR shall test system in the presence of the DISTRICT REPRESENTATIVE for full functionality. CONTRACTOR shall demonstrate system functions and settings to the DISTRICT REPRESENTATIVE.
7. CONTRACTOR shall create as-built sketch, close-out documentation, and complete system connectivity diagram for District as mentioned in the Specifications. Submit electronic copy in PDF format and editable version to the District (i.e. MS Word, Excel, DWG drawings, Autocad, etc).
8. Provide all warranties, manuals, and all system passwords to DISTRICT REPRESENTATIVE. CONTRACTOR shall remove all Contractor and technician passwords from server. Contractor should not leave any system with Bosch default passwords or access codes.
9. If indicated on drawings provide a monitor solution in the front office of school/s. Provide and install 32" TV monitor and mount 80" A.F.F. minimum. Monitor provided can be Vizio DF3210 smart TV or equal. Provide power and data for TV monitor also at 80" A.F.F. Install OF HP mini computer to the back of monitor.
10. Furnish and install appropriate computer mounting bracket to the back of monitor. Such as HP desktop Mini security /Dual VESA Sleeve MFG part 2JA32AA.
11. Mount TV to wall using best practices. The TV wall mount must hold a 10" to 42" plasma or LCD television that weighs up to 55 lbs. Included with the mount must be all the necessary hardware to mount most televisions. TV wall mount, also known as a plasma mount and an LCD mount, must be compatible for VESA standard 75 x 75 to 100 x 100. The TV wall mount also must have extending arms for up to VESA 200 x 200 to fit larger screens. The LCD mount, TV wall mount should have coverings for keeping the screws used to mount the display onto the wall out of sight. The TV wall mount should have an articulating arm that allows one to position the monitor. The range of motion should also allow you to tilt the monitor down up to 20° and extend the arm out up to 9-1/8". The TV wall mount will have clips that hold wires coming from the monitor to the arm to keep them neat. Sample product is Displays2Go SKU **W1AM1032M3 or equivalent.**
12. If a camera enabled Access Control system is indicated on drawings interface door camera with security system. If door camera is analog use Bosch encoder to bring analog footage into system. Provide and configure DS_VIP_X1_XF. Provide all required licenses to integrate

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encoder with systemThe above mentioned summaries does not relieve the CONTRACTOR from requirements set forth in the contract documents. CONTRACTOR is required to perform work under the guidelines of each Specification in its entirety even if such requirements are not specified in the summary above.

- C. Sample Close Out Document Templates are available online at: <https://bit.ly/2NsL2zk>
 - 1. The documents provided are for example purposes only. Follow written specifications above when determining what must be done.

END OF SECTION 28 23 00

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SECTION 28 31 11

DIGITAL ADDRESSABLE FIRE ALARM SYSTEM

1. GENERAL

1.1. SUMMARY

1.1.1. Section Includes:

1.1.1.1. NETWORK FIRE ALARM CONTROL (NODE)

1.1.1.1.1. Network fire alarm control panels shall include all features as described in this specification for stand-alone FACPs and shall have network communication capabilities as described herein.

1.1.2. All points monitored and controlled by a single node shall be capable of being programed as "Public". Each point made public to the network may be programmed to be operated by any other node connected to the network. Network Communications shall be capable of supporting "Central Station DACT Report" that can be handled as though they were a single point.

1.1.3. This section of the specifications includes the furnishing, installation, and connection of the fire alarm equipment to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control units, fire safety control devices, annunciators, power supplies, digitized voice evacuation signal, and wiring per the contract documents.

1.2. RELATED SECTIONS

1.2.1.1. Division 01

1.2.1.2. 26 05 00: Common Work Results for Electrical

1.2.1.3. 27 30 00: Voice Communications

1.2.1.4. 27 41 16: Audiovisual Systems

1.3. REFERENCES

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

1.3.2. The system and all associated operations shall be in accordance with the following:

1.3.2.1. Guidelines of the following Building Code: IBC

1.3.2.2. Guidelines of the following Building Code: IFC

1.3.2.3. NFPA 72, National Fire Alarm Code

1.3.2.4. NFPA 70, National Electrical Code

1.3.2.5. NFPA 101, Life Safety Code

1.3.2.6. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems

1.3.2.7. Other applicable NFPA standards

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1.3.2.8. Local Jurisdictional Adopted Codes and Standards

1.3.2.9. ADA Accessibility Guidelines

1.3.3. General: Comply with the following Underwriters Laboratories (UL) Listings:

1.3.3.1. UL 268 – Smoke Detectors for Fire Protective Signaling Systems

1.3.3.2. UL 864 – Control Units for Fire Protective Signaling Systems

1.3.3.3. UL2572 - Mass Notification Systems

1.3.3.4. UL217 - Smoke Detectors, Single and Multiple Station

1.3.3.5. UL228 - Door Closers - Holders for Fire Protective Signaling Systems

1.3.3.6. UL268A - Smoke Detectors for Duct Applications

1.3.3.7. UL521 - Heat Detectors for Fire Protective Signaling Systems

1.3.3.8. UL464 - Audible Signaling Appliances

1.3.3.9. UL38 - Manually Actuated Signaling Boxes

1.3.3.10. UL1481 - Power Supplies for Fire Protective Signaling Systems

1.3.3.11. UL346 - Waterflow Indicators for Fire Protective Signaling Systems

1.3.3.12. UL1076 - Control Units for Burglar Alarm Proprietary Protective Signaling Systems

1.3.3.13. UL1971 - Visual Notification Appliances

1.3.3.14. UL2017 - Standard for General-Purpose Signaling Devices and Systems

1.4. UL60950 - Safety of Information Technology Equipment

1.5. DEFINITIONS

1.5.1. Contractor – The entity responsible for performing or overseeing the installation and configuration of the system.

1.5.2. District – Long Beach Unified School District

1.5.3. District Approved Equivalent – A product that the Contractor submitted as equal to or greater than the product specified, which subsequently received District Board approval for use on the intended project. Refer to Division 01 for additional information.

1.5.4. District Standard – a design or brand that has been selected by the District Board as the acceptable product.

1.5.5. District Technology Representative – An individual from the District’s Facilities Technology Group. They should possess an official @lbschools.net email address.

1.5.6. District Representative – An authorized individual representing the District, for example a project manager or construction manager.

1.5.7. FACP – Fire Alarm Control Panel

1.5.8. Large Systems – 100 devices or more.

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- 1.5.9. Node - Each panel with direct communications into the Network is defined as a node.
- 1.5.10. Owner – The District’s Technology Information Services Branch (TISB), who will oversee the system after turnover.
- 1.5.11. Small Systems – Less than 100 devices.

1.6. SYSTEM REQUIREMENTS

- 1.6.1. The network shall provide a means to log into any node on the system via a laptop computer or CRT/Keyboard and have complete network access (Set Host) for diagnostics, maintenance reporting, and information gathering of all nodes in the system. Systems not meeting this requirement must provide all diagnostic tools required to support this function from selected points on the network. This Section covers fire alarm systems, including initiating devices, notification appliances, controls, and supervisory devices.
- 1.6.2. Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications. The system shall be an active/interrogative type system where each addressable device is repetitively scanned, causing a signal to be transmitted to the main fire alarm control panel (FACP) indicating that the device and its associated circuit wiring is functional. Loss of this signal at the main FACP shall result in a trouble indication.
- 1.6.3. The facility shall have an emergency voice alarm communication system. Digitally stored message sequences shall notify the building occupants that a fire or life safety condition has been reported. Message generator(s) shall be capable of automatically distributing up to eight (8) simultaneous, unique messages to appropriate audio zones within the facility based on the type and location of the initiating event. The Fire Command Center (FCC) shall also support Emergency manual voice announcement capability for both system wide or selected audio zones and shall include provisions for the system operator to override automatic messages system wide or in selected zones.
- 1.6.4. The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:
 - 1.6.4.1. Fire alarm and detection operations.
 - 1.6.4.2. Control and monitoring of elevators, smoke control equipment, door hold-open devices, fire suppression systems, emergency power systems, and other equipment as indicated in the drawings and specifications.
 - 1.6.4.3. One-way supervised automatic voice alarm operations.

1.7. SYSTEM DESCRIPTION

- 1.7.1. General: Provide a complete, non-coded, addressable, microprocessor-based fire alarm with voice evacuation system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein.
- 1.7.2. Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory. System shall be capable of storing dual configuration programs with one active and one in reserve. Panel shall be capable of full system operation during a new configuration download.

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- 1.7.3. History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.
- 1.7.4. Recording of Events: Record all alarm, supervisory, and trouble events by means of system printer. The printout shall include the type of signal (alarm, supervisory, or trouble) the device identification, date, and time of the occurrence. The printout differentiates alarm signals from all other printed indications.
- 1.7.5. Wiring/Signal Transmission:
 - 1.7.5.1. Transmission shall be hard-wired, using separate individual circuits for each zone of alarm operation as required or addressable signal transmission, dedicated to fire alarm service only.
 - 1.7.5.2. System connections for initiating, signaling line circuits and notification appliance circuits shall be Class B.
 - 1.7.5.3. Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.
- 1.7.6. Basic Performance:
 - 1.7.6.1. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.
 - 1.7.6.2. Speaker circuits may be controlled by NAC outputs built into the amplifiers, which shall function as addressable points on the Digital Audio Loop.
 - 1.7.6.3. Notification Appliance Circuits (NAC) speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone whichever is greater.
 - 1.7.6.4. Audio amplifiers and tone generating equipment shall be electrically supervised for normal and abnormal conditions.
 - 1.7.6.5. Notification Appliance Circuits (NAC) speaker circuits and control equipment shall be arranged such that loss of any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system.
 - 1.7.6.6. Speaker circuits shall be arranged such that there is a minimum of one speaker circuit per smoke zone.
 - 1.7.6.7. Speaker circuits shall be electrically supervised for open and short circuit conditions. If a short circuit exists on a speaker circuit, it shall not be possible to activate that circuit.
 - 1.7.6.8. Audio amplifiers and tone generating equipment shall be electrically supervised for abnormal conditions. Digital amplifiers shall provide built-in speaker circuits, field configurable as four Class B (Style Y), or two Class A (Style Z) circuits.
 - 1.7.6.8.1. Speaker circuits shall be 25 VRMS. Speaker circuits shall have 20% spare capacity for future expansion or increased power output requirements.

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1.7.6.8.2. The Long Beach Unified School District (District) monitors its own fire alarms. Connection to the FACP is via telephone (POTS) lines. The District has a Division of School Safety, which includes sworn officers and dispatchers, who are all District employees. Fire alarm calls come into a dispatch center and the District dispatches sworn officers as first responders. The contact information for the District's School Safety office is as follows: Chief Thomas Hickman, 562-997-8101. The District does not have a UL number and does not use a third party who would have such a number.

1.7.7. Remote Access:

1.7.7.1. FACP shall have the capability to provide Remote Access through a Dial-Up Service Modem using the public switched telephone system of a private switched telephone system.

1.7.7.2. A personal computer or technician's laptop, configured with terminal emulation software shall have the ability to access the FACP for diagnostics, maintenance reporting and information gathering.

1.7.7.3. FACP shall have the capability to provide third party access through a serial interface connection and be agency listed for specific interfaces and for the purpose.

1.7.7.4. FACP shall have the capability to provide remote access via an Internet/Intranet Interface. The Internet interface shall provide alternative access to system information using the familiar interface of a standard Internet browser. A remotely located fire professional can use this access to analyze control panel status during non-alarm conditions and can also use this information to assist local fire responders during alarm conditions.

1.7.8. Required Functions: The following are required system functions and operating features:

1.7.8.1. Priority of Signals: Fire alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Priority Two, Supervisory and Trouble events have second-, third-, and fourth-level priority respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.

1.7.8.2. Noninterfering: An event in one zone does not prevent the receipt of signals from any other zone. All zones are manually resettable from the FACP after the initiating device or devices are restored to normal. The activation of an addressable device does not prevent the receipt of signals from subsequent addressable device activations.

1.7.8.3. Transmission to Remote Central Station: Automatically route alarm, supervisory, and trouble signals to a remote central station service transmitter provided under another contract by LBUSD School Safety.

1.7.8.4. Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP and the remote annunciator, indicating the location and type of device.

1.7.8.5. Selective Alarm: A system alarm shall include.

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- 1.7.8.5.1. Indication of alarm condition at the FACP and the annunciator(s).
- 1.7.8.5.2. Identification of the device/zone that is the source of the alarm at the FACP and the annunciator(s).
- 1.7.8.5.3. Operation of audible and visible notification devices on the fire floor, floor above and floor below until silenced at FACP.
- 1.7.8.5.4. Selectively closing doors normally held open by magnetic door holders on the fire floor, floor above and floor below.
- 1.7.8.5.5. Unlocking designated doors.
- 1.7.8.5.6. Shutting down supply and return fans serving zone where alarm is initiated.
- 1.7.8.5.7. Closing smoke dampers on system serving zone where alarm is initiated.
- 1.7.8.5.8. Initiation of smoke control sequence through the building temperature control system.
- 1.7.8.5.9. Notifying the local fire department.
- 1.7.8.5.10. Initiation of elevator recall in accordance with ASME/ANSI A17.1, when specified detectors or sensors are activated.
- 1.7.8.6. Supervisory Operations: Upon activation of a supervisory device such as fire pump power failure, low air pressure switch, and tamper switch, the system shall operate as follows.
 - 1.7.8.6.1. Activate the system supervisory service audible signal and illuminate the LED at the control unit and the remote annunciator.
 - 1.7.8.6.2. Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.
 - 1.7.8.6.3. Record the event in the FACP historical log.
 - 1.7.8.6.4. Transmission of supervisory signal to remote central station.
 - 1.7.8.6.5. Restoring the condition shall cause the Supervisory LED to clear and restore the system to normal.
- 1.7.8.7. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible and visible alarm signals shall cease operation.
- 1.7.8.8. System Reset:
 - 1.7.8.8.1. The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-arming the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."

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- 1.7.8.8.2. Should an alarm condition continue, the system will remain in an alarmed state.
- 1.7.8.9. A manual evacuation (drill) switch shall be provided to operate the notification appliances without causing other control circuits to be activated.
- 1.7.8.10. WALKTEST: The system shall have the capacity of 8 programmable passcode protected one person testing groups, such that only a portion of the system need be disabled during testing. The actuation of the "enable one-person test" program at the control unit shall activate the "One Person Testing" mode of the system as follows:
 - 1.7.8.10.1. The city circuit connection and any suppression release circuits shall be bypassed for the testing group.
 - 1.7.8.10.2. Control relay functions associated to one of the 8 testing groups shall be bypassed.
 - 1.7.8.10.3. The control unit shall indicate a trouble condition.
 - 1.7.8.10.4. The alarm activation of any initiation device in the testing group shall cause the audible notification appliances assigned only to that group to sound a code to identify the device or zone.
 - 1.7.8.10.5. The unit shall automatically reset itself after signaling is complete.
 - 1.7.8.10.6. Any opening of an initiating or notification appliance circuit wiring shall cause the audible signals to sound for 4 seconds indicating the trouble condition.
- 1.7.8.11. Support additional Fire Command Centers, capable of simultaneous monitoring of all system events. Alternate Fire Command Centers can transfer the control functions to an alternate Fire Command Center when necessary. All Fire Command Centers shall be individually capable of assuming Audio Command functions such as Emergency Paging, audio zone control functions.
- 1.7.9. Analog Smoke Sensors:
 - 1.7.9.1. Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.
 - 1.7.9.2. Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.
 - 1.7.9.3. Programmable Sensitivity: Photoelectric Smoke Sensors shall have 7 selectable sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP.
 - 1.7.9.4. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be viewed on a CRT Display or printed for annual recording and logging of the calibration maintenance schedule.
 - 1.7.9.5. The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to automatically indicate when a

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sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate if a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a sensor approaching dirty without creating a trouble in the system. If this indicator is ignored and the second level is reached, a "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported to the Central Monitoring Station. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit.

- 1.7.9.6. The FACP shall continuously perform an automatic self-test on each sensor which will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.
- 1.7.9.7. Multi-Sensors shall combine photoelectric smoke sensing and heat sensing technologies. An alarm shall be determined by either smoke detection, with selectable sensitivity from 0.2 to 3.7 %/ft. obscuration; or heat detection, selectable as fixed temperature or fixed with selectable rate-of-rise; or based on an analysis of the combination of smoke and heat activity.
- 1.7.9.8. Programmable bases. It shall be possible to program relay and sounder bases to operate independently of their associated sensor.
- 1.7.9.9. Magnet test activation of smoke sensors shall be distinguished by its label and history log entry as being activated by a magnet.
- 1.7.10. Smoke Detectors: A maintenance and testing service providing the following shall be included with the base bid.
 - 1.7.10.1. Biannual sensitivity reading and logging for each smoke sensor.
 - 1.7.10.2. Scheduled biannual threshold adjustments to maintain proper sensitivity for each smoke sensor.
 - 1.7.10.3. Threshold adjustment to any smoke sensor that has alarmed the system without the presence of particles of combustion.
 - 1.7.10.4. Scheduled biannual cleaning or replacement of each smoke detector or sensor within the system.
 - 1.7.10.5. Semi-annual functional testing of each smoke detector or sensor using the manufacturer's calibrated test tool.
 - 1.7.10.6. Written documentation of all testing, cleaning, replacing, threshold adjustment, and sensitivity reading for each smoke detector or sensor device within the system.
 - 1.7.10.7. The initial service included in the bid price shall provide the above listed procedures for a period of five years after District acceptance of the system.
- 1.7.11. Intelligent Thermal Detectors:

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1.7.11.1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit Fixed Temperature. 195 degrees where required. It shall connect via two wires to the fire alarm control panel signaling line circuit.

1.7.12. Manual Fire Alarm Stations:

1.7.12.1. Manual fire alarm stations shall be non-code, non-break glass type, equipped with key lock so that they may be tested without operating the handle.

1.7.12.2. Stations must be designed such that after an actual activation, they cannot be restored to normal except by key reset.

1.7.12.3. An operated station shall automatically condition itself so as to be visually detected, as operated, at a minimum distance of 100 feet (30.5 m) front or side.

1.7.12.4. Manual stations shall be constructed of high impact Lexan, with operating instructions provided on the cover. The word FIRE shall appear on the manual station in letters one half inch (12.7 mm) in size or larger.

1.7.12.5. Fire alarm systems shall include one manual pull station located in the campus administrative office.

1.7.13. Waterflow Indicator:

1.7.13.1. Waterflow Switches shall be an integral, mechanical, non-coded, non-accumulative retard type.

1.7.13.2. Waterflow Switches shall have an alarm transmission delay time which is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds.

1.7.13.3. All waterflow switches shall come from a single manufacturer and series.

1.7.13.4. Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.

1.7.13.5. Where possible, locate waterflow switches a minimum of one (1) foot from a fitting which changes the direction of the flow and a minimum of three (3) feet from a valve.

1.7.13.6. Confirm that wires are not exposed or easily accessible.

1.7.14. Sprinkler and Standpipe Valve Supervisory Switches:

1.7.14.1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.

1.7.14.2. PIV (post indicator valve) or main gate valves shall be equipped with a supervisory switch.

1.7.14.3. The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.

1.7.14.4. The supervisory switch shall be contained in a weatherproof aluminum

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housing, which shall provide a 3/4-inch (19 mm) conduit entrance and incorporate the necessary facilities for attachment to the valves.

1.7.14.5. The switch housing shall be finished in red baked enamel.

1.7.14.6. The entire installed assembly shall be tamper-proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.

1.7.14.7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

1.7.15. Power Requirements:

1.7.15.1. The control unit shall receive AC power via a dedicated fused disconnect circuit.

1.7.15.2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal AC power in a normal supervisory mode for a period of 24 hours with 15 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.

1.7.15.3. All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control unit.

1.7.15.4. The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green "power on" LED shall be displayed continuously at the user interface while incoming power is present.

1.7.15.5. The system batteries shall be supervised so that a low battery or a depleted battery condition, or disconnection of the battery shall be indicated at the control unit and displayed for the specific fault type.

1.7.15.6. The system shall support NAC Lockout feature to prevent subsequent activation of Notification Appliance Circuits after a Depleted Battery condition occurs in order to make use of battery reserve for front panel annunciation and control.

1.7.15.7. The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.

1.7.15.8. Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

1.7.16. UDACT Requirements:

1.7.16.1. Existing Central Station UDACT Report shall be based on final signage and building labeling submittals. For existing facilities Contractor shall obtain from the District or Architect a copy of the current site layout, floor plan, and building labeling designations.

1.7.16.2. DSA Inspector of Record (IOR) shall verify the Central Station UDACT Report is based on final signage and building labeling submittals.

1.7.16.3. The UDACT shall be supplied with two eight conductors, two to six-foot-long line cords. One end of the cords shall plug into the jacks on the UDACT. The

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other end of the cords shall plug into industry standard RJ-31X surface mounted telephone jacks. Install jacks in a screw cover box adjacent to the FACP if sufficient space is not available within the FACP, or adjacent fire alarm terminal cabinet. The line cords shall be installed in conduit when it is necessary to locate the jacks remotely from the FACP enclosure. The jacks shall be mounted to the rear of the box. The Primary and Secondary telephone number for each line shall be labeled on its respective jack. Two individual multipair telephone cables shall be installed from the MPOE (main point of entry) to the FACP. The telephone cables shall be labeled at both ends with FA PRIMARY and FA SECONDARY.

1.8. QUALITY ASSURANCE

- 1.8.1. Installer Qualifications: A factory authorized installer is to perform the work of this section.
- 1.8.2. Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label
- 1.8.3. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.
- 1.8.4. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

1.9. SUBMITTALS

- 1.9.1. General: Submit the following according to Conditions of Contract.
 - 1.9.1.1. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.
 - 1.9.1.2. Wiring diagrams from manufacturer.
 - 1.9.1.3. Shop drawings showing system details including location of FACP, all devices, circuiting and details of graphic annunciator.
 - 1.9.1.4. System Power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate per the prescribed backup time periods and under all voltage conditions per UL and NFPA standards.
 - 1.9.1.5. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of IDC, NAC, relay, Sensor, and auxiliary control circuits.
 - 1.9.1.6. Operating instructions for FACP.
 - 1.9.1.7. Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type product, including all features and operating sequences, both automatic and manual. Provide the names, addresses, and telephone numbers of service organizations.

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1.9.1.8. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements
Record of field tests of system.

1.9.2. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions if required to make clarifications revisions to obtain approval.

1.10. CLOSEOUT SUBMITTALS

1.10.1. Fire Alarm Documents (FAD) Cabinet by Notifier Honeywell: Provide all documents as required per site

1.10.2. Operation and Maintenance Data

1.10.3. Warranties

1.10.4. Initial Service Agreement

1.10.5. As-Built Drawings

1.10.6. Fire Alarm Zone Map: 11x17, laminated or framed and mounted adjacent to panel. Zone map shall be updated upon completion of each phase of the project.

1.10.7. NFPA Record Documents

1.10.8. Demonstration and Training Video

1.10.9. Transmittal of Keys to District Representative. Contractor is responsible for coordinating with LBUSD Maintenance Lock Shop and School Safety to provide any construction keys that are changed over.

1.10.10. Central Station UDACT Report

1.10.11. Project Deliverables shall be submitted after completion of each phase and include the following: Record of Completion and Record of Inspection and Testing.

1.11. EXTRA MATERIALS

1.11.1. General: Furnish extra materials, packaged with protective covering for storage, and identified with labels clearly describing contents as follows:

1.11.1.1. Strobe Units: Furnish quantity equal to 10 percent of the number of units installed, but not less than one.

1.11.1.2. Smoke Detectors and CO2 Sensors: Furnish quantity equal to 10 percent of the number of units of each type installed but not less than one of each type.

1.11.1.3. Heat Detectors: Furnish quantity equal to 10 percent of the number of units of each type installed but not less than one of each type.

1.11.1.4. Detector or Sensor Bases: Furnish quantity equal to 2 percent of the number of units of each type installed but not less than one of each type.

1.11.1.5. Manual Pull Station and associated cover/bases: Furnish quantity equal to no less than one of each type installed.

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1.12. MAINTENANCE SERVICE

- 1.12.1. Maintenance Service Contract: Provide maintenance of fire alarm systems and equipment for a period of 12 months, using factory-authorized service representatives.
- 1.12.2. Basic Services: Systematic, routine maintenance visits on a quarterly basis at times scheduled with the District. In addition, respond to service calls within 24 hours of notification of system trouble. Adjust and replace defective parts and components with original manufacturer's replacement parts, components, and supplies.
- 1.12.3. Additional Services: Perform services within the above 12-month period not classified as routine maintenance or as warranty work when authorized in writing. Compensation for additional services must be agreed upon in writing prior to performing services.
- 1.12.4. Renewal of Maintenance Service Contract: No later than 60 days prior to the expiration of the maintenance services contract, deliver to the District a proposal to provide contract maintenance and repair services for an additional one-year term. District will be under no obligation to accept maintenance service contract renewal proposal.

2. PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

- 2.1.1. Manufacturers: The equipment and service described in this specification are those supplied and supported by Honeywell and represent the base bid for the equipment.
 - 2.1.1.1. Subject to compliance with requirements, provide products by only the following:
 - 2.1.1.1.1. Notifier by Honeywell (for Large Systems)
 - 2.1.1.1.2. Firelite by Honeywell (for Small Systems)
- 2.1.2. Being listed as an acceptable Manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications.
- 2.1.3. The Manufacturer shall be a nationally recognized company specializing in fire alarm and detection systems. This organization shall employ factory trained and NICET certified technicians and shall maintain a service organization within 100 miles of this project location. The Manufacturer and service organization shall have a minimum of 10 years' experience in the fire protective signaling systems industry.
- 2.1.4. Underground Conductors
 - 2.1.4.1. West Penn Aquaseal <http://www.westpenn-wpw.com/>
 - 2.1.4.2. Or Approved Equal
- 2.1.5. Miscellaneous Components
 - 2.1.5.1. Wire Guard Protective Covers: Provide covers by Safety Technology International, Inc., at gymnasium strobes, www.sti-usa.com
 - 2.1.5.2. Or Approved Equal
- 2.1.6. Knox Box: Coordinate with requirements of local AHJ and District Door Hardware Specification 08 71 00Knox Box: Coordinate with requirements of local AHJ and District Door Hardware Specification 08 71 00

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2.1.7. Fire Alarm Documents (FDS) Cabinet by Honeywell, Model DN-61031-A

2.2. FIRE ALARM CONTROL PANEL (FACP)

2.2.1. The following FACP hardware shall be provided:

2.2.1.1. Power Limited base panel, 120 VAC input power.

2.2.1.2. Emergency Voice/Evacuation Communication System.

2.2.1.3. FACP shall have up to a 3,180 capacity with 159 alarm points and 159 modules per SLC loop card.

2.2.1.4. 500 points of Network Annunciation at FACP Display when applied as a Network Node

2.2.1.5. 500 points of annunciation where one (1) point of annunciation equals:

2.2.1.5.1. 1 LED driver output on a graphic driver or 1 switch input on a graphic switch input module.

2.2.1.5.2. 1 LED on panel or 1 switch on panel.

2.2.1.6. From all battery charging circuits in the system provide battery voltage and ammeter readouts on the FCP LCD Display.

2.2.1.7. Municipal City Circuit Connection with Disconnect switch, 24VDC Remote Station (reverse polarity), local energy, shunt master box, or a form "C" contact output.

2.2.1.8. One Auxiliary electronically resettable fused 2A @24VDC Output, with programmable disconnect operation for 4-wire detector reset.

2.2.1.9. One Auxiliary Relay, SPDT 2A @32VDC, programmable as a trouble relay, either as normally energized or de-energized, or as an auxiliary control.

2.2.1.10. Where required provide Intelligent Remote Battery Charger for charging up to 110Ah batteries.

2.2.1.11. Power Supplies with integral intelligent Notification Appliance Circuit Class B for system expansion.

2.2.1.12. Four (4) form "C" Auxiliary Relay Circuits (Form C contacts rated 2A @ 24VDC, resistive), operation is programmable for trouble, alarm, supervisory of other fire response functions. Relays shall be capable of switching up to ½ A @ 120VAC, inductive.

2.2.1.13. The FACP shall support six (6) RS-232-C ports and one (1) service port.

2.2.1.14. Remote Unit Interface: supervised serial communication channel for control and monitoring of remotely located annunciators and I/O panels.

2.2.1.15. Modular Network Communications Card.

2.2.1.16. Programmable DACT for either Common Event Reporting or per Point Reporting.

2.2.1.17. Service Port Modem for dial in passcode access to all fire control panel information.

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- 2.2.2. Distributed Module Operation: FACP shall be capable of allowing remote location of the following modules: interface of such modules shall be through a Style 4 (Class B) supervised serial communications channel (SLC):
 - 2.2.2.1. Addressable Signaling Line Circuits
 - 2.2.2.2. Initiating Device Circuits
 - 2.2.2.3. Notification Appliance Circuits
 - 2.2.2.4. Auxiliary Control Circuits
 - 2.2.2.5. Graphic Annunciator LED/Switch Control Modules
- 2.2.3. Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control unit, provide exactly matching modular unit enclosures.
- 2.2.4. Alphanumeric Display and System Controls: Panel shall include an 80-character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.

2.3. REMOTE LCD ANNUNCIATOR

- 2.3.1. Provide a remote LCD Annunciator with the same "look and feel" as the FACP operator interface. The Remote LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys, Status LEDs, and LCD Display as the FACP.
- 2.3.2. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with four (4) programmable control switches and associated LEDs.
- 2.3.3. Under normal conditions the LCD shall display a "SYSTEM IS NORMAL" message and the current time and date.
- 2.3.4. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.
- 2.3.5. The annunciator shall connect to a separate, dedicated "terminal mode" EIA-485 interface. Connection shall be equivalent to a two-wire loop connection and be capable of distances up to 6,000 feet. Each terminal mode LCD display shall mimic the main control panel.
- 2.3.6. The LCD shall display the following information relative to the abnormal condition of a point in the system:
 - 2.3.6.1. 40-character custom location label.
 - 2.3.6.2. Type of device (e.g., smoke, pull station, waterflow).
 - 2.3.6.3. Point status (e.g., alarm, trouble).
- 2.3.7. Operator keys shall be key switch enabled to prevent unauthorized use. The key shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP. The system shall allow a minimum of 32 terminal mode LCD annunciators. Up to 10 LCD annunciators shall be capable of the following system functions: Acknowledge, Signal Silence and Reset, functions shall be protected from

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unauthorized use by a key switch or password.

3. EXECUTION

3.1. INSTALLATION

- 3.1.1. Install the networked fire alarm system in accordance with manufacturer's instructions.
- 3.1.2. Coordinate the installation of fire alarm equipment with the manufacturer or authorized distributor.
- 3.1.3. Install conductors and wiring according to the manufacturer's recommendations.
- 3.1.4. Coordinate with the supplier regarding correct wiring procedures before installing conduits or conductors.
- 3.1.5. Install system components in accordance with DSA & CSFM requirements, appropriate NFPA Standards, specified requirements, National Electrical Code, local and state regulations, requirements of fire department, and other applicable authorities having jurisdiction (AHJ).
- 3.1.6. Install all conduit for power and data entering each equipment rack, panel, enclosure, box, cabinet and significant equipment from the side or bottom.
- 3.1.7. Equipment Identification:
 - 3.1.7.1. System labels and devices programming addresses shall be based on final signage and building labeling submittals. For existing facilities, Contractor shall obtain from the District, an approved site layout and building and room labeling designations.
 - 3.1.7.2. Install a nameplate on each individual equipment rack, enclosure, boxes, cabinet, and significant equipment item.
 - 3.1.7.3. Use identifiers and abbreviations defined in the Drawings whenever possible. Use plan designation for labeling, unless indicated otherwise.
 - 3.1.7.4. Nameplates shall be laminated black phonemic resin with a white core and engraved lettering, a minimum of ¼" high.
 - 3.1.7.5. Engrave using upper case letters of uniform height; centered on device, cover plate, or enclosure; with all characters made clearly and distinctly.
 - 3.1.7.6. All equipment shall have the manufacturer's name, address, model number, and rating on a name plate securely affixed in a conspicuous place. All equipment shall bear labels attesting to Underwriters Laboratories approval where subject to Underwriters Laboratories label service.
 - 3.1.7.7. Identify all field terminals and relays with device identification. Lettering shall be 3/16" high minimum.

3.2. FIELD QUALITY CONTROL

- 3.2.1. Final Test: The final Test shall be performed in the presence of the DSA IOR. Perform the following before the installation shall be considered completed and acceptable by awarding authority:
 - 3.2.1.1. Operate by the Contractor's job foreman, in presence of a representative of the

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manufacturer, a representative of the District and extend invitation to fire department for every installed device to verify proper operation and correct annunciation at control panel.

- 3.2.1.2. Perform at least one half of all tests on battery standby power.
- 3.2.1.3. Where application of heat would destroy any detector, it may be manually activated.
- 3.2.1.4. Open signaling line circuits and notification appliance circuits in at least 2 locations to verify presence of supervision.
- 3.2.1.5. When testing has been completed to satisfaction of both Contractor's job foreman and representatives of the manufacturer and the District, a notarized letter co-signed by each attesting to satisfactory completion of said testing shall be forwarded to the Owner and fire department.
- 3.2.1.6. Leave the fire alarm system in proper working order, and, without additional expense to the Owner, replace defective materials and equipment provided under this contract within 1 year (365 days) from date of final acceptance by the owner.
- 3.2.1.7. Notify the fire department before the final test in accordance with local requirements.

3.3. TEST AND INSPECTION REPORT

- 3.3.1. Only a factory-authorized service representative trained shall be allowed to test and inspect components, assemblies, and equipment installations, including connections.
- 3.3.2. Perform the following tests and inspections:
 - 3.3.2.1. Visual Inspection: Conduct visual inspection prior to testing.
 - 3.3.2.1.1. Inspection shall be based on completed record Drawings and system documentation that is required by the "Documentation" chapter in NFPA 72.
 - 3.3.2.1.2. Comply with the "Visual Inspection" table in the "Inspection" section of the "Inspection, Testing, and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
 - 3.3.2.2. System Testing: Comply with the "Testing" table in the "Testing" section of the "Inspection, Testing, and Maintenance" chapter in NFPA 72.
 - 3.3.2.3. During inspection the software shall automatically comply and generate "Fire Alarm System Record of Completion" in the "Documentation" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing, and Maintenance" chapter in NFPA 72.
- 3.3.3. Annual Test and Inspection: One year after date of Completion, test fire alarm system complying with visual and testing inspection requirements in NFPA 72.

3.4. SYSTEM COMMISSIONING AND TESTING

- 3.4.1. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

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- 3.4.2. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
- 3.4.3. All the following functions of the system shall be performed and tested:
 - 3.4.3.1. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
 - 3.4.3.2. Verify activation of all flow switches.
 - 3.4.3.3. Open initiating device circuits and verify that the trouble signal actuates.
 - 3.4.3.4. Open signaling line circuits and verify that the trouble signal actuates.
 - 3.4.3.5. Open and short notification appliance circuits and verify that trouble signal actuates.
 - 3.4.3.6. Ground initiating device circuits and verify response of trouble signals.
 - 3.4.3.7. Ground signaling line circuits and verify response of trouble signals.
 - 3.4.3.8. Ground notification appliance circuits and verify response of trouble signals.
 - 3.4.3.9. Check presence and audibility of tone at all alarm notification devices.
 - 3.4.3.10. Check installation, supervision, and operation of all intelligent smoke detectors during a walk test.
- 3.4.4. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
- 3.4.5. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.5. FINAL INSPECTION

- 3.5.1. At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.
- 3.5.2. If Project includes phased construction, all documentation, including but not limited to NFPA 72 Record of Completion, NFPA 72 Record of Inspection and Testing, and UDACT points list must signed by DSA IOR and submitted to the District, prior to occupancy of building(s).

3.6. USER INSTRUCTION AND TRAINING

- 3.6.1. Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
 - 3.6.1.1. Before Completion and with a fully functional fire alarm system installed at the site provide the following closeout trainings:
 - 3.6.1.1.1. The Contractor shall provide up to four hours of user training for

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site-based staff.

- 3.6.1.1.2. The Contractor shall provide a minimum of one (1) technical training of up to 40 hours of Fire Lite program
- 3.6.1.1.3. The date and time for trainings shall be coordinated with the District Representative. Provide notification at least two (2) weeks in advance
- 3.6.2. Before Completion, provide one instruction period for the Project site-based operators and system users. The instruction period shall be scheduled and coordinated with the District Representative.
- 3.6.3. Training materials and required deliverables shall be submitted to the District Representative prior to day of training.
 - 3.6.3.1. The contractor and/or the systems manufacturer's representatives shall provide the following to the attendees:
 - 3.6.3.1.1. Training Agenda
 - 3.6.3.1.2. System operation Instructions
 - 3.6.3.2. Have staff attendees sign off training sheet and provide a copy to the DSA IOR.
- 3.6.4. Prior to beginning the operational demonstration, notify Central monitoring Station that an instructional activity is beginning; inform them that it includes setting and resetting the system in test mode. After the demonstration is completed and the system restored, notify the Central Monitoring Station that the system has been restored and it is back online for continuous monitoring.
- 3.6.5. Instruction period training for site-based staff shall consist of the following:
 - 3.6.5.1. Overview:
 - 3.6.5.1.1. Explain the fire system is “addressable” which means every device-smoke detector, heat detector, sprinkler water flow switch, manual pull station, etc. has a unique address or identity. This makes it possible to positively identify the exact device causing an alarm, trouble, or supervisory condition.
 - 3.6.5.1.2. Explain the fire alarm control panel also controls the horns and strobes throughout the campus or building.
 - 3.6.5.1.3. Explain that the fire alarm system is interconnected to various other systems and equipment throughout the site such as:
 - 3.6.5.1.4. Explain the fire system has a battery backup in case of power failure and that it will continue to function for a minimum of 24 hours after a total power failure.
 - 3.6.5.1.5. Explain that the fire alarm system components and wiring are monitored to report a malfunction, damage, or vandalism. When this occurs, a trouble indication will appear on the fire alarm annunciator and FACP and this indication will be transmitted to the central monitoring station.
 - 3.6.5.1.6. Explain that other equipment and systems are monitored for abnormal conditions such as the fire sprinkler water being turned

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off. When this occurs, a supervisory condition is created. A supervisory indication will appear on the fire alarm annunciator and FACP and this indication will be transmitted to the central monitoring station.

- 3.6.5.1.7. Explain that the fire system in addition to notifying the occupants of a possible fire condition also transmits an alarm indication to the central monitoring station that will in turn notify and dispatch the local fire department to your site.

3.6.5.2. Basic:

- 3.6.5.2.1. Hand out the SYSTEM OPERATION instructions to attendees.
- 3.6.5.2.2. Point out the Fire Alarm Control Panel and have them observe the normal LED status (one green LED only should be on):
 - 3.6.5.2.2.1. GREEN = Normal.
 - 3.6.5.2.2.2. YELLOW = Trouble.
 - 3.6.5.2.2.3. RED = ALARM.
- 3.6.5.2.3. Have the attendees observe the LCD display that should be indicating a SYSTEM NORMAL message.
- 3.6.5.2.4. Point out the Fire Alarm System Annunciator and have attendees observe the LCD display that should be indicating a SYSTEM NORMAL message.

3.6.5.3. Operation and Demonstration:

- 3.6.5.3.1. After putting the system or having someone put the system central station monitoring into the test mode demonstrate the following:
- 3.6.5.3.2. Activate a Manual Pull Station to demonstrate ALARM.
 - 3.6.5.3.2.1. Demonstrate audible and visual notification appliances and if installed the voice evacuation signal announcement.
 - 3.6.5.3.2.2. Demonstrate panel or annunciator sounder tone for ALARM.
 - 3.6.5.3.2.3. Have staff SILENCE system.
 - 3.6.5.3.2.4. Show LCD display and LED of alarm.
 - 3.6.5.3.2.5. Demonstrate and have staff reset the manual pull station.
 - 3.6.5.3.2.6. Have staff RESET fire system.
- 3.6.5.3.3. Activate Smoke Detector with canned smoke to demonstrate address identification:
 - 3.6.5.3.3.1. Have staff SILENCE system.
 - 3.6.5.3.3.2. Show LCD and display LED of ALARM.

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- 3.6.5.3.3. Have staff RESET fire system.
- 3.6.5.3.4. Remove Smoke Detector to demonstrate SYSTEM TROUBLE.
 - 3.6.5.3.4.1. Demonstrate panel or annunciator sounder tone for TROUBLE.
 - 3.6.5.3.4.2. Have staff SILENCE system.
 - 3.6.5.3.4.3. Show LCD display and LED of TROUBLE.
 - 3.6.5.3.4.4. Replace the smoke detector.
 - 3.6.5.3.4.5. Have staff RESET fire system.
- 3.6.5.3.5. Remove power to demonstrate function during power failure.
 - 3.6.5.3.5.1. Have staff SILENCE system.
 - 3.6.5.3.5.2. Show LCD display and LED of TROUBLE.
 - 3.6.5.3.5.3. Activate manual pull station to demonstrate audible or visual functions in power failure mode.
 - 3.6.5.3.5.4. Reset manual pull station.
 - 3.6.5.3.5.5. Reset fire system.
 - 3.6.5.3.5.6. If applicable, point out sprinkler riser and shut off valves.
 - 3.6.5.3.5.7. Show location of a water flow switch.
 - 3.6.5.3.5.8. Show location of a valve tamper switch.
 - 3.6.5.3.5.9. Point out valves must always be OPEN or fully counter clockwise.
 - 3.6.5.3.5.10. Point out PIV (Post Indicator Valves) if applicable.
 - 3.6.5.3.5.11. Have water flow through the inspector's test valve and point out the ringing water flow bell.
 - 3.6.5.3.5.12. After the horns are silenced by an assistant, show that the water flow bell is ringing continuously indicating water flow.
 - 3.6.5.3.5.13. Have the assistant turn off the inspector's test valve to show that water flow alarm bell turns off.
 - 3.6.5.3.5.14. Reset system.
 - 3.6.5.3.5.15. Unlock and turn off a PIV or riser valve to show a supervisory condition.
 - 3.6.5.3.5.16. Turn valve back on, lock the valve open and demonstrate the end of the indication of a supervisory condition.
- 3.6.5.3.6. Ensure fire panel is reset and indicates normal and central station

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monitoring is taken off of the test mode.

END OF SECTION

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SECTION 31 11 00 SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY:

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely clear and demolish all materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. RELATED SECTIONS:
 - 1. Contract General Conditions and Division 1, General Requirements
 - 2. Section 31 20 00 – Earthwork: Excavation, Filling, and Grading

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. In accordance with Specification Section GENERAL REQUIREMENTS, and the following:
 - a. Materials and equipment used for this project shall comply with the current applicable regulations of the California Air Resources Board [CARB] and the Environmental Protection Agency [EPA].
- B. Meetings:
 - 1. Meetings shall include Pre-Clearing and Demolition Meetings.
 - 2. Participants (or designated representative of) invited to attend each of the above meetings shall be as follows:
 - a. Contractor.
 - b. Owner.
 - c. Architect.
 - d. Testing Laboratory.
 - e. Local Governing Authorities as applicable.
 - f. Utility Representatives as applicable.
 - g. Owner's Inspector.
 - h. Clearing and Demolition Subcontractor.
 - i. Other subcontractors, as appropriate (including any accessory subcontractors).

1.4 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Dust Control
 - 1. The Contractor shall comply with all requirements of the South Coast Air Quality Management District (SCAQMD) for construction activity related to this project.
 - 2. A Dust Control Plan, as required by the SCAQMD, may be required for this project. The Contractor shall be responsible for preparing said Dust Control Plan, submitting to the Agency for review and approval, and paying all SCAQMD review and permitting fees related to the Dust Control Plan.
 - 3. No construction activity related to this project may begin until Contractor has secured an approved Dust Control Plan, if one is required.

4. Contractor shall be solely responsible for implementing all requirements of the Dust Control Plan throughout the life of this contract.
 5. Should fines or fees be levied against the Project for violations of the Dust Control Plan and/or related SCAQMD regulations, Contractor shall be responsible to pay all said fines or fees and implementing all mitigation measures required by SCAQMD in order to bring the construction activity into compliance. The costs for any such fines or fees shall be included in the lump sum price bid for work under this contract and no additional payment will be made.
- B. Existing Conditions:
1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
 2. Conduct work so as not to interfere unnecessarily with adjacent roads, streets, drives, walks or occupied facilities.
 - a. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and Authorities having jurisdiction.
 - b. Provide alternate routes around closed or obstructed traffic ways if required by Authorities having jurisdiction.
 3. Locate and identify utilities.
 - a. Call DIG Alert – (800) 422-4133 or at 811 for the task of locating any applicable off-site and on-site utilities in the area where the Project is located.
 4. Carefully remove items indicated to be salvaged and store on Owner's premises at the Owner's direction.

PART 2 - PRODUCTS

(NOT APPLICABLE)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordination:
1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
- B. Protection:
1. Protect and maintain all benchmarks and survey control points from disturbance during clearing and demolition operations.
 2. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties.
 3. Furnish and install temporary protection/barrier fencing surrounding the limits of demolition.
 4. Protect trees, plant growth, and features not specifically designated for removal. Locate and clearly flag trees and vegetation to remain or to be relocated.
 5. Protect existing improvements designated to remain from damage during construction.
 - a. Restore damaged improvements to their original condition, as acceptable to the Owner.

3.2 CONSTRUCTION

- A. Vegetation, Shrub, Topsoil, Weed Removal:
 - 1. Remove weeds and rooted topsoil to a minimum four (4) inch depth and temporarily stockpile as needed for re-use in finished grading of landscape areas. Remove excess material from the site.
 - 2. Where existing vegetation is to be replaced by new materials, remove contaminated or excess soil from the site and legally dispose of off-site.
- B. Existing Site Improvements Removal:
 - 1. Remove existing above and below grade improvements as necessary to facilitate new construction.
 - a. Remove concrete slabs, sidewalk, curbs, mow strips, gutters, and fence post footings.
 - 1) Neatly saw-cut length of existing pavement to remain before removing existing pavement unless existing full-depth joints coincide with line of demolition. Saw-cut faces vertically.
 - b. Remove indicated utility improvements within the limits of construction.
 - 1) Excavate for and disconnect utilities designated to be removed. Seal or cap off underground.
 - 2) Coordinate removal and/or relocation of utilities with the appropriate utility agencies.
 - c. Where existing underground utilities, irrigation pipes, wells, leach fields, or underground tanks are encountered, they must be removed or moved to a point at least 5 feet horizontally outside the proposed building and 3 feet horizontally outside the concrete flatwork or pavement construction areas. All resultant cavities must be backfilled with engineered fill.
- C. Existing Utilities to Remain or be Relocated:
 - 1. Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - a. Notify Architect and the Owner not less than seven (7) days in advance of proposed utility interruptions.
 - b. Arrange to shut off indicated utilities with utility companies and Owner.
- D. Disposal:
 - 1. Legally dispose of all debris (surplus soil materials, unsuitable topsoil, obstructions, demolished materials, waste materials, trash, etc.) resulting from clearing, grubbing, demolition and from construction. Disposal of all materials shall be at a location secured by the Contractor off of the Owner's property.

END OF SECTION 31 11 00

SECTION 31 20 00 EARTHWORK: EXCAVATION, FILLING AND GRADING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY:

- A. This Section includes the following:
 - 1. Excavating soil and other material for surface improvements.
 - 2. Placing fill.
 - 3. Compaction of existing ground and fill.
 - 4. Preparation of subgrade for other improvements.
 - 5. Grading of soil.
- B. RELATED SECTIONS
 - 1. Contract General Conditions and Division 1, General Requirements

1.3 REFERENCES

- A. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18-inch (457 mm) Drop.
- B. Standard Specifications for Public Works Construction (GREENBOOK), latest edition

1.4 DEFINITIONS

- A. Utility: Any buried or above ground pipe, conduit, cable, associate device or appurtenances, or substructure pertaining thereto.

1.5 SUBMITTALS

- A. Product Data:
 - 1. Information indicating the source of all import material, the fill material type and where it is to be used, and approval of the District's Inspector of Record for incorporation of import material into the Work.
- B. Material Test Reports:
 - 1. Classification of Soils.
 - 2. Compaction Characteristics of Soils.
 - 3. Density and Unit Weight of Soils in Place.
 - 4. Imported fill shall be tested and approved by the Owner's Geotechnical Engineer prior to import to the site, including testing for compliance with Department of Toxic Substances Control (DTSC) guidelines. Said testing and certification documents shall be paid for by the Owner.
- C. Project Closeout: In accordance with Specification Section PROJECT CLOSEOUT.
 - 1. Drawings indicating the extent and depth of all engineered fill, and over-excavation and re-compaction. This information shall be a part of the Project "As-Built" and Project

"Record" Documents in accordance with the Specification Section PROJECT DOCUMENTS.

1.6 QUALITY ASSURANCE

- A. Certificates:
 - 1. Contractor's certification (on Contractor's letterhead paper) that the Earthwork materials and installation meets or exceeds the requirements of this specification.
 - 2. If Fill (Soil or Aggregates) are brought onto site, vendor shall supply a Materials Report or Sieve Analysis of soil composition.
- B. Construction:
 - 1. Ensure all Subgrade preparation, relative compaction and subgrade tolerances comply with GREENBOOK Section 301.

1.7 COORDINATION

- A. Provide required notification to the Owner and Geotechnical Engineer or the Engineer of Record so that a representative from the Owner's Geotechnical Engineering consultant can be present for all excavation, filling and grading operations to test and observe earthwork construction.
- B. Verify that the location of existing utilities has been indicated at work site by utility authorities, by Owner, and as specified on the Plans.

1.8 EXISTING CONDITIONS

- A. Existing Conditions:
 - 1. Examine the site and verify conditions with the Drawings and Specifications. Contractor shall familiarize himself with the existing site conditions and any changes that have occurred at the site since the preparation of the contract documents and shall be responsible to account for any such changes in the price bid for this work.
 - 2. Thoroughly investigate and verify conditions under which the Work is to be performed.
 - 3. Locate and identify utilities:
 - a. Call DIG Alert – (800) 422-4133 or at 811 for the task of locating any applicable off-site and on-site utilities in the area where the Project is located.
 - 4. No allowance for Extra Work will be granted resulting from negligence or failure to meet the requirements of this Section.
- B. Determine exact location of existing buried utilities by:
 - 1. Marking on ground or pavement surface the alignment and extent of the facilities and the probable location of existing utilities using construction plans and existing surface features.
 - 2. Provide DIG Alert a minimum of two (2) working days' notice of request for locations and notify Owner of said request concurrently.
 - 3. Confirm exact location of existing utilities by hand methods of excavation, or by use of vacuum equipment.

1.9 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of GENERAL CONDITIONS and DIVISION 1, GENERAL REQUIREMENTS.
- B. Accurately record actual locations of utilities encountered including depth and horizontal location, as measured from permanent site features.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Subgrade Compacted Fill for New Ramp and Footing: All subgrade material for compacted fill shall be Crushed Aggregate Base (CAB) complying with Greenbook Section 200-2.2. Ensure that material is properly compacted to a minimum relative compaction of 95 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify site conditions are consistent with conditions indicated in the contract documents.

3.2 EXCAVATION

- A. Following clearing and stripping operations, excavate planned construction areas as specified in this Section.
- B. Soil disturbed by prior construction activities, undocumented fill deemed to possess inadequate compaction or uniformity, debris, and abandoned underground structures must be excavated to expose undisturbed native soil or suitable fill.
- C. Within the area of the planned improvements plus at least 5 feet horizontally beyond the perimeter of these improvements, the subgrade must be over-excavated at least 24 inches below the stripped, undisturbed soils, or to 12" below the bottom of footings, whichever is lower.
- D. Following over-excavation, the exposed ground surface must be reviewed by the Geotechnical Engineer to evaluate if loose soils or soft zones are present that require additional excavation. The exposed subgrade shall be proof rolled under the observation of the Geotechnical Engineer to detect soft or pliant areas. Soft or pliant areas must be over-excavated to firm native soil. The exposed surface shall be scarified to a minimum depth of 8-inches, uniformly moisture conditioned to 2 percent above optimum moisture, and compacted to 90% relative compaction.

3.3 FILLING AND COMPACTING

- A. Once clearing, stripping and over-excavation operations are complete, scarify the surface to receive fill material or improvements to a depth of 8-inches, moisture condition to at least 2% above optimum moisture content, and compact to a minimum of 90% of maximum dry density (relative compaction) based on ASTM Test Method 1557.
- B. The upper 12 inches of engineered fill placed as backfill under pavement sections shall be compacted to at least 95% of the maximum dry density.
- C. Upon approval, on-site soils may be suitable for re-use as Engineered Fill, providing they are cleansed of excessive organics (less than 3 percent by weight, ASTM D2974), debris, and fragments larger than three (3) inches in maximum dimension and meet the requirements of soil Type S4, Division 31 Specification Section SOIL MATERIALS.
- D. Engineered Fill shall be moisture conditioned to within 2% of optimum moisture, placed in uncompacted layers not exceeding eight (8) inches in thickness, and compacted as specified, based on ASTM Test Method D1557.
 - 1. Non-vegetative surface improvement areas (structures and site concrete improvements) - To a minimum of 90% of maximum dry density (relative compaction).

2. Vegetative surface improvement areas (turf and planters) - Below top twelve (12) inches - to a minimum of 90% of maximum dry density (relative compaction). Top twelve (12) inches - 85% of maximum dry density (relative compaction).
3. Pavement areas: to a minimum 95% of maximum dry density (relative compaction) in top twelve (12) inches.

E. which will not disturb or damage existing utilities and other improvements.

3.4 PREPARATION OF SUBGRADE FOR SURFACE IMPROVEMENTS

- A. Where concrete, asphalt-concrete, aggregate base, or other non-vegetative surface improvements, or a layer of said surface improvements, are to be constructed on the soil surface, prepare the subgrade for said improvements in accordance with this section.
- B. Scarify the soil as specified and remove and dispose of (off the project site) all rocks, hardpan chunks or otherwise unsuitable material over 3-inches in size.
- C. Thoroughly moisture condition and compact as described above.

3.5 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ANSI/ASTM D1557.
- B. If tests indicate work does not meet specified requirements, recompact, or remove and replace, and retest.
- C. All retesting required because of failure of initial test will be performed by Owner's testing agency, at the expense of the Contractor.

3.6 PROTECTION

- A. Protect graded areas from traffic, freezing, erosion, and all other sources of damage. Keep free of debris and trash.
- B. Repair and re-establish grades to specified tolerances where completed or partially completed work becomes eroded, rutted, settled, or where it is damaged by subsequent construction operations or weather.
- C. Where settlement occurs prior to acceptance of the work, remove and replace surface improvements, excavate, replace, and re-compact in accordance with these specifications, and restore the surface improvements.

3.7 CLEANING

- A. Remove all surplus or unsatisfactory soil material, trash, and debris, and legally dispose of off of the Owner's property.

END OF SECTION 31 20 00

SECTION 31 22 15 FINISH GRADING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Machinery restrictions.
 - 2. Excavation, filling and backfilling of on site material.
 - 3. Subgrade preparation and spreading of topsoil.
 - 4. Finished grading.
 - 5. Prevention of excessive weed growth in lawns.
 - 6. Drainage.
- B. Related Sections
 - 1. Earthwork – Section 31 20 00
 - 2. Lawns and Grasses - Section 32 92 00
 - 3. Planting - Section 32 93 00

1.2 GENERAL PROVISIONS

- A. Finished grading shall be defined as placing and grading of additional soil that will be required to bring the grade to the required grades for lawns, shrub and groundcover beds.
- B. Additional fill materials shall generally be defined as topsoil as specified herein unless otherwise specified.
- C. Where practicable and as directed, the use of heavy machinery shall be kept to a minimum.
- D. Refer to Section 32 93 00 for finish grading of shrub and groundcover beds.

1.3 INFORMATIONAL SUBMITTALS

- A. Soil analysis of all on site topsoil to be used for finished grading and planting media prior to stock piling. Soil tests/analysis to be submitted to Landscape Architect along with any planned amendments to meet requirements.

PART 2 - PRODUCTS

2.1 FILL

- A. General Qualifications: Fill shall be a clean, dry soil of a loamy character, well drained and well graded with a plasticity index not to exceed 20 or fall below 8. Fill material shall contain no oils, alkalies, acids, rubbish or other deleterious materials. The pH shall be similar to the approved topsoil.

2.2 TOPSOIL

- A. Topsoil material that will be required for finish grading operations shall conform to the requirements included within this Section and shall come from on site stockpiles.

- B. General Qualifications for Topsoil:
 "On-Site" Topsoil shall be considered as material conforming to the following minimum criteria:
 - 1. Natural, friable, loamy soil, typical of local topsoil which produces heavy vegetative growth, free from subsoil, weeds, sods, stiff clay, stones larger than 1", toxic substances, debris, or other substances which may be harmful to plant growth. Do not deliver in muddy condition.
 - 2. Acidity/Alkalinity: pH 6.0 to pH 7.5.
- C. Grading Analysis: 2" sieve, 100% minimum passing. Number 4 sieve, 90% minimum passing. Number 10 sieve, 80% minimum passing.
 - 1. Sand, Silt, and Clay Content (from ASSHTO M146):
 - a. Sand 20 - 45%
 - b. Silt 20 - 40%
 - c. Clay 10 - 15%
 - 2. All topsoil shall be free from all herbicides and insecticides which might adversely affect subsequent growth of turf or plantings or which might otherwise contain materials toxic to humans and pets.
- D. Non-Conforming Material: The Contractor shall not be permitted to use on-site material which does not conform to the above minimum criteria for fine grade operations. At the discretion of the Owner's representative, such material can either be amended to meet the minimum requirements or shall be removed from the site and replaced with suitable material as specified herein.
- E. It shall be the Contractor's responsibility to verify that the existing topsoil conforms to these specifications. Topsoil determined to be non-conforming subsequent to the award of a contract shall not be means for extra compensation unless otherwise provided for herein.
- F. Soil Analysis: The Contractor shall obtain an agricultural soil analysis of topsoil taken from four areas of the site. These samples shall be submitted to an accredited and approved soils laboratory at Contractor's cost. Submit results of soil analysis to the Owner for review. The soil analysis shall include recommendations for amendments to the soil to produce optimum plant growth from the variety of plants and grasses proposed. These amendments shall be made at the Contractor's expense and shall be included in the bid.

2.3 SAND

- A. Shall be Bank Sand. Sample shall be submitted for approval. Sand shall be used for minor finish grade corrections and shall not be permitted for grading purposes if the depth exceeds 1/2" to achieve the finished grade.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Work shall be performed by personnel trained and experienced in this work and shall be done under the direction of a superintendent on Contractor's staff.

3.2 PREPARATION OF SUBGRADE AND SPREADING OF TOPSOIL

- A. The subgrade soil when at optimum soil moisture shall be loosened to a depth of 4" by disking or tilling and then graded to remove all ridges and depressions so that it will be everywhere parallel to the proposed finished grade. All stones over 1 1/2" in any dimensions, sticks, rubbish and other extraneous matter shall be removed during this operation. If soil clumps over 2" in diameter remain, then make additional passes with a harrow or other approved equipment to reduce below the 2" size. No heavy objects except rollers shall be moved over lawn areas after the subgrade soil has been prepared before topsoil is spread.
- B. After the subgrade soil has been prepared, topsoil from the stockpile areas and imported topsoil shall be spread evenly therein to depth of 4" by an approved method. No topsoil shall be spread in a frozen or muddy condition. Areas to receive topsoil are defined as follows:
 - 1. "On-Site Topsoil" – Areas to receive grass (sod, hydroseed, native seeding).
- C. On all grass areas, the finished surface of the topsoil shall conform to the finished grade and shall be free from hollows or other inequalities, stones, sticks and other extraneous matter.
- D. Existing "Topsoil" will not be used for groundcover, perennial, or shrub areas to meet final grade. Imported planting soil shall be used to "cap" the repurposed topsoil and eliminate the germination of any dormant seed.

3.3 FINISH GRADING

- A. In areas to receive lawns, this Contractor shall till, disc, or otherwise scarify the soil to a depth of 4" removing all clods, stones, and related material 1" or larger.
- B. This Contractor shall be responsible for minor adjustments to the finished subgrade if such treatment is required in the opinion of the Owner's representative.
- C. The Contractor may use machinery acceptable to the Owner's representative to complete most of the work to re-establishing finished grade.
- D. Hand-rake the surface, removing all clods and undesirable material greater than 1/2" from ground surface. Fill all low spots and cut irregularities to the acceptance of the Owner's representative. Roll the entire surface evenly with a 200 pound water ballast roller or other means acceptable.
- E. During the finished grading operations, all swales and additional swales that may be required to drain areas where there are existing plant materials, shall be finished. In general, all grade adjustments shall be made so there are no areas that will have standing water.
- F. To prevent excessive weed growth in the lawn areas, the Contractor should be prepared to immediately install the sod or seeding upon the completed and acceptable finished grade.
- G. Prior to installation of grass or groundcovers, contact Landscape Architect to inspect and approve finish grade.

END OF SECTION 31 22 15

SECTION 31 23 33 TRENCH EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. A Geotechnical Engineering Investigation Report has been prepared for the project by BSK Associates; BSK Project No. G17-039-11F, dated May 12, 2017. A copy of the report is available (for reference only) at the cost of reproduction. Contact BSK Associates if a copy of the report is desired.

1.2 SUMMARY:

- A. SECTION INCLUDES
 - 1. Excavating trenches, holes and pits for constructing the Work.
 - 2. Backfill and compaction.
 - 3. Providing suitable bedding and backfill material, as specified herein.
- B. RELATED SECTIONS
 - 1. Contract General Conditions and Division 1, General Requirements.
 - 2. Section 311100 - Site Clearing
 - 3. Section 312000 - Earthwork: Excavation, Filling and Grading

1.3 REFERENCES

- A. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18-inch (457 mm) Drop.

1.4 DEFINITIONS

- A. Utility: Any buried or above ground pipe, conduit, cable, associate devices or appurtenances, or substructure pertaining hereto.

1.5 QUALITY ASSURANCE

- A. Qualifications
 - 1. Installer:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this project within the past 5 years.
- B. Regulatory Requirements:
 - 1. In accordance with Specification Section REGULATORY REQUIREMENTS and the following:
 - a. CARB Materials and equipment used for this Project shall comply with the current applicable regulations of the California Air Resources Board [CARB].
 - b. CD City of Dinuba, Codes and Ordinances
 - c. EPA Environmental Protection Agency.

- d. CAL/OSHA Comply with all provisions of the Construction Safety Orders and the General Safety Orders of the California Division of Occupational Safety and Health, as well as all other applicable regulations as they pertain to the protection of workers from the hazard of caving ground excavations.
- C. Certificates:
 - 1. Installer's certification that all trench backfill installation meets or exceeds the requirements of this specification.
 - 2. Contractor's certification (on Contractor's letterhead paper) that the trench backfill materials and installation meet or exceed the requirements of this specification.
- D. Meetings:
 - 1. Pre-Installation: Schedule prior to the start of work.
 - a. Coordinate the work with other work being performed.
 - b. Identify any potential problems, which may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
 - 2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
 - 3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems which may impede issuance of warranties or guaranties.
 - 4. Maintain installed work until the Notice of Substantial Completion has been filed.

1.6 COORDINATION

- A. Coordinate work with Owner's personnel.
- B. Verify that the locations of existing utilities have been indicated at work site by utility authorities.

1.7 EXISTING UTILITIES

- A. Where subsurface work involves more than the normal depth of excavation required for the removal and/or construction of surface improvements (surface improvements such as concrete work, paving, landscaping, signs, etc.), the Engineer will have made a diligent attempt to indicate on the plans the location of all main and trunkline utility facilities which may affect the Work. In many cases, however, the only available information relative to the existing location of said facilities may have been small scale undimensioned plats. The locations of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.
- B. Under circumstances similar to 31 23 33/1.7A, service laterals and appurtenances will have also been shown where information was available as to their location. In many cases, however, the only available information relative to the existing location of said facilities may have been small scale undimensioned plats. The locations of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.
- C. Determine exact location of existing buried utilities by:
 - 1. Marking on ground or pavement surface the alignment and extent of the proposed facilities and the probable location of existing utilities using construction plans and existing surface features.
 - 2. Requesting Underground Service Alert (USA) to indicate location of existing buried facilities (phone 1-800-227-2600). Provide USA a minimum of two (2) working days'

- notice of request for locations and notify Owner of said request concurrently.
3. Locate exact location of existing utilities by hand methods of excavation, or by use of vacuum equipment.
- D. At proposed work location, expose by hand methods (or vacuum equipment) all existing utilities along the route of the proposed work prior to using any mechanical equipment. If mechanical equipment is allowed at a particular location, it may only be used after the completion by the Contractor of a successful exhaustive search by hand (or vacuum equipment) methods to locate all existing facilities as indicated on the plans, and/or as indicated on the ground by USA or Owner's personnel.
 - E. Provide Field Engineering per Contract General Conditions and Division 1 to record the location of all utilities encountered. Where locational conflicts exist between existing utilities and the planned location of facilities to be constructed under the Contract, submit detailed information to the Owner's Inspector and Engineer for review and direction.
 - F. Maintain all existing utility mains and service lines in constant service during construction of the Work.
 - G. Where service disruptions are allowed, minimize the length of such disruptions by proper scheduling and diligent pursuit of the work.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

- A. Fill Type S1, S2, S4 and S5, as specified in Division 31 Specification Section SOIL MATERIALS.

2.2 WARNING TAPE

- A. 6" wide warning tape shall be installed over all the pipelines as shown on the details.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect plant life, lawns, trees, shrubs, and other features not authorized for removal.
- B. Protect existing structures, fences, sidewalks, curbs, and other improvements from excavation equipment and vehicular traffic.
- C. Maintain and protect above and below grade utilities which are to remain.
- D. Comply with all provisions of the Construction Safety Orders and General Safety Orders of the California Division of Industrial Safety, as well as all other applicable regulations as they pertain to the protection of workers from the hazard of caving ground in excavations.

3.2 EXCAVATION

- A. Excavate soil required to locate existing utilities and install the work.

- B. Use hand methods of excavation to locate existing utilities, and to excavate trenches, pits and holes in congested areas.
- C. Employ equipment and methods appropriate to the work site. Small mechanical excavators may be used only in areas where there is sufficient space so as not to damage adjacent improvements, and where the locations of all existing utilities have been determined by hand methods of excavating.
- D. Cut trenches just wide enough to enable installation and proper bedding and backfill, and to allow inspection.
- E. Do not interfere with 45 degree (1:1) bearing splay of foundations.
- F. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose material.
- G. Excavate trenches, pits or holes bottoming in hardpan to a minimum of 6 inches below the grade for the bottom of the pipe and any couplings, and then backfill to the pipe grade with Type S2 or S5 material, containing sufficient moisture to allow compaction to 90% maximum dry density (relative compaction). Soil Type S2 shall meet requirements of Type S5. No additional payment will be made for such over-excavation and refill.
- H. In all trenches or excavation sites where a firm foundation is not encountered, such as soft, spongy, or otherwise unsuitable material, remove the material to a minimum of 12 inches, or to a depth determined by the Engineer, below the bottom of the proposed pipe or structure, and backfill the space with Type S2 or S5 material containing sufficient moisture to allow compaction to 90% maximum dry density (relative compaction). Soil Type S2 shall meet requirements of Type S5. No additional payment will be made for such additional excavation or backfill.
- I. Excavate trenches to provide the design grade of the facility, or as directed by the Engineer.
- J. Stockpile excavated material to be returned to trench adjacent thereto in location which will not be detrimental to existing improvements, or pedestrian or vehicular traffic. Remove from site all unsuitable or excess material not to be used.
- K. When excavating through tree roots, perform work by hand and cut roots, where authorized, with a saw.
- L. Upon Owner's approval, stockpile excess soil not used for backfill at an on-site location designated by the Owner. Obtain a disposal site off the Owner's property and legally dispose of said excess material, all at no additional cost to the Owner.
- M. If water is encountered during excavations, provide all dewatering measures necessary to construct improvements shown.
- N. Contractor shall make all provisions necessary, including but not limited to, shoring or sloping back trench walls as required to address sandy soils. The cost of these provisions shall be included in the lump sum amount bid for this work and no separate payment will be made therefore.

3.3 PROTECTION OF EXCAVATIONS

- A. Provide all shoring and bracing as required and those codified in local, state and federal safety regulations.

- B. Prevent water, caving or sloughing ground from entering excavations.
- C. Maintain excavations free of water.

3.4 BACKFILLING

- A. Provide type S2 or S5 pipe bedding as required by Plans and compact to 90% maximum dry density (relative compaction). Soil Type S2 shall meet requirements of Type S5.
- B. After installation of pipes and appurtenances and placement of pipe bedding material, backfill trenches and excavations to finished grade, or subgrade in areas to receive surface improvements.
- C. Backfill trenches above pipe bedding material and to within 24 inches of finish subgrade with Type S1, S2, S4, or S5 soils, except that that top 12 inches shall be type S2, S3, S4, or S5 soils.
- D. Employ a placement method that does not disturb or damage existing or proposed pipes or other Utilities or Improvements.
- E. Place and compact all soil backfill in continuous layers not exceeding 8 inches in loose uncompacted thickness, moisture condition to at least 2% above optimum moisture content.
- F. Maintain optimum moisture content of fill materials to attain required compaction.
- G. Backfill final 12-inch thickness to finish subgrade in areas to receive concrete, asphalt-concrete, aggregate base, or other non-vegetative surface improvement, with Type S2, S4, or S5 soils.
- H. Backfill final 12-inch thickness to finish subgrade in areas to receive sod, other vegetation, or bare soil, with Type S2 or S3 soils.
- I. Compact backfill below the top 12-inches to 90% maximum dry density (relative compaction).
- J. In areas to receive buildings, structures, or concrete flatwork, compact the top 12-inches to 90% maximum dry density (relative compaction).
- K. In areas to receive asphalt concrete pavement or concrete pavement subject to vehicular traffic, compact the top 12-inches to 95% maximum dry density (relative compaction).
- L. In planting areas, compact the top 12-inches to 85% maximum dry density (relative compaction).

3.5 TOLERANCES

- A. Top Surface of Backfill under Paved or Concrete Areas: Plus or minus 0.02 feet from required elevations.
- B. Top Surface of General Backfilling: As required for finish surface to match adjacent improvements or ground.

3.6 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of General Conditions and/or

Division 1.

- B. Compaction testing will be performed in accordance with ANSI/ASTM D1557.
- C. If tests indicate work does not meet specified requirements, recompact, and retest. Retests required due to failure of initial tests shall be paid for by the Contractor.

3.7 PROGRESS AND PROSECUTION

- A. Backfill any excavation opened in any day on that same day.

END OF SECTION 31 23 33

SECTION 32 11 23 AGGREGATE BASE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Material requirements and construction methods for placing aggregate base.

1.2 RELATED REQUIREMENTS

- A. Section 31 20 00 - Earthwork
- B. Section 32 12 16 - Asphalt Paving: Finish and binder asphalt courses.

1.3 REFERENCE STANDARDS

- A. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)); 2012 (Reapproved 2021).
- B. California Test Method 301 – Method of Test for Determining the Resistance R Value of Treated and Untreated Bases, Subbases, and Basement Soils by Stabilometer
- C. California Test Method 217 – Method of Test for Sand Equivalent
- D. ASTM C127 – Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate

1.4 SUBMITTALS

- A. Materials Test Report or Sieve Analysis of materials being delivered to site
- B. Samples: 10 lb. (4.5 kg) sample of each type of aggregate; submit in air-tight containers to testing laboratory.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When aggregate materials need to be stored on site, locate where directed by Owner.
- C. Aggregate Storage, General:
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Aggregate Base materials used for this project shall comply with Standard Specifications of Public Works Construction (GREENBOOK) Section 200-2.2 'Crushed Aggregate Base'

PART 3 EXECUTION

3.1 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.

3.2 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.

3.3 INSTALLATION

- A. Spread aggregate over prepared substrate to a total compacted thickness of 4 inches.
- B. Under Asphalt Concrete Paving:

1. Place coarse aggregate to a total compacted thickness of 4 inches.
 2. Compact to 95 percent of maximum dry density.
- C. Place aggregate in maximum 4-inch (100 mm) layers and roller compact to specified density.
 - D. Level and contour surfaces to elevations and gradients indicated.
 - E. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

3.4 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).

3.5 FIELD QUALITY CONTROL

- A. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.
- B. 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").

END OF SECTION 32 11 23

SECTION 32 12 16 ASPHALT PAVING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated in the Contract Documents and specified herein.
- B. The following types of pavements shall be covered in this Section:
 - 1. Paving for new walkway areas between re-locatable buildings as indicated in Construction Documents.
- C. Related Sections:
 - 1. Section 31 20 00: Earthwork: Excavation, Filling and Grading
 - 2. Section 32 11 23: Aggregate Base
 - 3. Section 32 12 36: Seal Coats

1.3 SUBMITTALS

- A. Mix Designs: The Contractor shall submit a job-mix formula in accordance with the Standard Specifications for Public Works Construction (GREENBOOK) Section 203-6.3 to the Engineer for approval. The mixture should be for Asphalt Concrete 'Type III-C3-PG-64-10' material.
- B. Certificates:
 - 1. Submit certificates of compliance from the supplier for bituminous materials for binder, asphaltic concrete, and tack coat.
 - 2. Submit weigh master's certificates or certified delivery tickets for each truck load of asphaltic material delivered to the project site.

1.4 QUALITY ASSURANCE

- A. The work provided herein shall conform to and be in accordance with the Standard Specifications for Public Works Construction (GREENBOOK), 2024 Edition, adopted by the Southern California Chapter, American Public Works Association; herein referred to as the "Standard Specifications".
- B. The Owner's inspector shall test the temperature of each batch of asphaltic concrete prior to placement. At the time of delivery to the work site, the temperature of mixture shall not be lower than 260 degrees F or higher than 320 degrees F, the lower limit to be approached in warm weather and the higher in cold weather. If asphaltic concrete temperature is not within these tolerances the affected batch shall be rejected. Any and all costs due to the rejected asphaltic concrete shall be the responsibility of the paving contractor.
- C. Asphaltic Concrete Producers Qualifications: Use only materials furnished by a bulk asphaltic concrete producer regularly engaged in production of hot mix, hot laid bituminous

concrete.

- D. Applicator Qualifications: Paving machine and roller operators shall be fully trained and experienced in the installation of asphaltic concrete paving projects of similar size and complexity.
- E. Regulatory Requirements: The quantity of volatile organic compounds (V.O.C.) used in weed killer, seal coat, primer and other materials shall not exceed the limits permitted under the current regulations of the local authorities having jurisdiction.

1.5 ESTABLISHMENT OF GRADES

- A. The Contractor's Surveyor will set grade stakes. The Surveyor shall be a California registered land surveyor or licensed Civil Engineer. The Surveyor shall be hired and paid by the Contractor and shall be subject to the approval of the Owner. Contractor shall notify the Owner at least 48 hours before staking is to be started. The Owner will determine if work is ready for staking.
- B. All work shall conform to the lines, elevations, and grades shown on the Construction Plans. Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected. Any such variation shall be reported to the Engineer. In the absence of such report, the Contractor shall be responsible for any error in the grade of the finished work.
- C. Protect and maintain stakes in place until their removal is approved by the Owner. Grade or location stakes lost or disturbed by Contractor, shall be reset by the Surveyor at the expense of Contractor.

1.6 ENVIRONMENTAL LIMITATIONS

- A. Do not apply asphalt materials if the substrate is wet or excessively damp or if the following conditions are not met:
 - 1. Tack Coats: Minimum surface temperature of 60 deg F.
 - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

1.7 WARRANTY

- A. The contractor shall provide a manufacturer's warranty against "alligator cracking" and settlement.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Base Course Material: Crushed Aggregate Base (CAB) material shall consist of materials that meet the provisions of Specification Section 32 11 23: Aggregate Base.
- B. Asphalt Surfacing Materials - Furnish asphalt surfacing meeting the following requirement, furnished from a commercial asphalt central mixing plant:
 - 1. Paint Binder/Tack Coat: Asphalt emulsion shall be CSS-1 or CSS-1h and shall conform to the requirements of Standard Specifications Section 203-3 Emulsified Asphalt.

2. Asphalt Concrete Composition & Grading:
 - a. Asphalt concrete shall conform to Standard Specification Section 203-6.4, Type C3
 - b. Asphalt performance grade shall be PG-64-10.
 - c. At least two courses of asphalt shall be laid when Type C2 asphalt pavement is greater than 2.5 inches. The surface course shall be a minimum thickness of one inch (1") and a maximum of two inches (2").
 - d. Rubberized asphalt paving is not allowed.

2.2 WEED CONTROL

- A. The soils sterilant shall be in accordance with current EPA acceptable standard and the California Department of Pesticide Regulations for soils sterilant. Sterilant shall be selected as appropriate for the environment in which it is to be placed. Contractor shall be licensed with the State of California to apply sterilant. Sterilant shall be commercial grade for commercial application. Payment for soil sterilization will include full compensation for application and all materials and incidental work required.
- B. Headers and Stakes:
 1. Headers: Pressure Treated Redwood, Construction Heart Grade, size 2 x 6, unless otherwise indicated on construction drawings
 2. Stakes: 2 x 4 redwood or 2 x 3 Douglas fir, Construction Grade.
 3. Nails: Common, galvanized, 12d minimum.

PART 3 EXECUTION

3.1 HEADERS

- A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.
- B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of adjacent undisturbed earth.
- C. Fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid grade a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on centers with top of stakes set one inch below top of header. Provide a minimum of 2-12d galvanized common nails through each stake.
- D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.
- E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.
- F. Provide additional stakes and anchorage as required to fasten headers in place

3.2 SUBGRADE PREPARATION

- A. Subgrade Preparation:
 1. Refer to Project Geotechnical Report for Subgrade Preparation methods and recommendations.
 2. Prior to placement of engineered fill, the subgrade shall be scarified to a depth of at least 8 inches, moisture conditioned and recompacted to a minimum 90% relative

density.

- B. The above subgrade preparation recommendations are based on the assumption that soils encountered during field exploration are representative of soils throughout the site. However, there can be unforeseen and unanticipated variations in soils between points of subsurface exploration. For this reason, the actual subgrade preparation will have to be determined on the basis of in-grading observations and testing performed by representatives of the project geotechnical consultant.
- C. A California Licensed Surveyor (LS) must provide grade stakes and elevations for the Geotechnical Engineer to verify that the over-excavation depths, shown on the construction drawings for asphalt concrete pavement structural sections, have been achieved prior to re-compaction.
- D. Subgrade tolerances: Subgrade for pavement shall not vary more than 0.02' from the specified grade and cross section established by the Engineer. Subgrade for subbase or base material shall not vary more than 0.04' from the specified grade and cross section. Variations within the above specified tolerances shall be compensated so that the average grade and cross-section specified are met.
- E. Correct irregularities by dressing down or filling as may be required, to bring areas to true subgrade elevations.
- F. Where filling is required, scarify the subgrade to bond the new material to the in-place material; use additional material as required, subject to the approval of the Architect, and provided by the Contractor.
- G. Remove excess material from the site to a legal disposal area.

3.3 APPLICATION GENERAL

- A. Finish elevations, extent of asphalt paving and locations of type of asphalt and class of base shall be as indicated and specified herein and on the Construction Documents. Bring subgrade elevations sufficiently below the finish elevations of the paving to accommodate the thickness of paving and base.

3.4 STERILANT APPLICATION

- A. Place herbicide below pavement crushed aggregate base course. Meet the applicable environmental control requirements. Apply as directed by the manufacturer's printed instructions just before application of the base course. Sterilant shall not be applied within two feet of planting areas.

3.5 APPLICATION OF BASE COURSE

- A. Install base course material, encompassing spreading and compacting, in accordance with the S.S.P.W.C. Section 301-2, Untreated Base.
- B. Aggregate bases material shall be installed in layers not exceeding 3-inches and compacted to a minimum of 95% relative density.
- C. After preparing the subgrade as specified in 3.5.A, all traffic on the subgrade shall be avoided. Should it be necessary to haul over the prepared subgrade, the Contractor shall drag and roll the traveled way as frequently as may be necessary to remove ruts, cuts, and

breaks in the surface. All cuts, ruts, and breaks in the surface of the subgrade that are not removed by the above operations shall be raked and hand tamped. All equipment used for transporting materials over the prepared subgrade shall be equipped with pneumatic tires.

- D. Continued use of sections of prepared subgrade for hauling, to cut up or deform it from the true cross-section, will not be permitted.
- E. Maintain the surface in its finished condition until the succeeding layer is placed.

3.6 PLACING ASPHALT CONCRETE SURFACING

- A. Asphalt binder (tack coat) shall be applied to all existing pavement surfaces to be overlaid and/or joined per section 302-5.8 of the Standard Specifications. Asphalt binder (tack coat) shall be applied to existing surfaces to be surfaced and between layers of asphalt concrete, except when eliminated by the Engineer. A layer of asphalt binder (tack coat) shall be applied to all vertical-cut faces and between subsequent AC lifts.
- B. Asphalt Concrete Pavement:
 - 1. All work shall be in accordance with Section 302-5 of the Standard Specifications, except as noted herein. Asphalt concrete work shall include full-depth patching and variable thick asphalt concrete transition areas. The Contractor shall, on a daily basis, provide the Inspector with copies of certificates of weight for all materials delivered to the job site and/or incorporated in the work. At no time shall the coarse aggregate that has segregated from the mix be scattered across the paved mat.
 - 2. Asphalt concrete shall not be placed on any surface, which contains ponded water or excessive moisture in the opinion of the Engineer. If paving operations are in progress and rain or fog forces a shutdown, loaded trucks in transit shall return to the plant, and no compensation will be allowed therefore. The Contractor shall furnish and use canvas tarpaulins to cover all loads of asphalt from the time that the mixture is loaded until it is discharged from the delivery vehicle, unless otherwise directed in writing by the Engineer.
 - 3. The Inspector will examine the base before the paving has begun. The Contractor will correct any deficiencies before the paving is started.
 - 4. Successive courses may be laid upon previously laid courses as soon as the previous course has cooled sufficiently to show no perceivable displacement under equipment or loaded material delivery trucks and a tack coat has been applied.
 - 5. Wherever AC pavement does not terminate against a curb, gutter, or another pavement, the Contractor shall provide and install a redwood or pressure treated Douglas fir header at the line of termination.
 - 6. Pavement at all longitudinal joints shall have a Field Density of 95%, as described in 302-5.6.2 of the Standard Specifications. When the test results of the field cores are less than 95% Relative Compaction, the Contractor shall remove a 1 foot wide section on each side of the longitudinal joint. The Contractor shall replace the removed pavement with an asphalt mix that meets the job specification at no additional cost to the Owner.
 - 7. Pavement tolerances: within 1/8-inch of design thickness and 1/8-inch from design elevation.

3.7 FLOOD TESTING

- A. Flood Test: Before acceptance, all pavements shall be water tested to ensure proper drainage as directed by the Inspector. The Contractor shall provide water for this purpose. The flooding shall be done by water tank truck. Depressions where the water ponds to a depth of more than 1/8-inch shall be filled or the slope corrected to provide proper drainage. The edges of the fill shall be feathered and smoothed so that the joint between the fill and

the original surface is invisible. No standing water shall remain after 30 minutes on a 70 degree F (or warmer) day.

3.8 FIELD QUALITY CONTROL

- A. Thickness: Tolerances for asphalt pavement thickness shall be ¼ inch, plus or minus.
- B. All paving shall drain properly before being accepted. Upon completion, the pavement shall be true to grade and cross section. The asphalt substrate, shall not vary from the planned cross slope by more than +/- 0.1. When a 10 foot straightedge is laid on the finished surface of the asphalt, the surface shall not vary from the edge of the straightedge more than 1/8 inch, except at grade breaks. Where paving does not meet these tolerances, the paving material shall be repaired by a method determined by the Owner. Repairs shall not be made to pavement surface by feather-edging at the join lines. All expenses for pavement repair up shall be borne by the Contractor at NO cost to the Owner.
- C. Corrective Measures: It is the Contractor's responsibility to determine if the planarity, cross slopes, and general specifications have been met. If all of the conditions have been met the Contractor must notify the Owner in writing of the acceptance of the asphalt paving.

3.9 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.10 CLEAN UP

- A. Clean all debris and unused materials from the paving operation. Clean all surfaces that have been spattered or defaced as a result of the paving operation. Asphalt or asphalt stains which are noticeable upon surfaces of concrete, or materials which will be exposed to view, shall be promptly and completely removed. Cleaning shall be done in a manner that will not result in any discharge of contaminated materials into any catch basin. All expenses for cleanup shall be borne by the Contractor at NO cost to the Owner.

END OF SECTION 32 12 16

SECTION 32 12 36 SEAL COATS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated in the Contract Documents and specified herein.
- B. The following types of pavements shall be covered in this Section:
 - 1. Paving for existing parking lots as indicated in Construction Documents.
- C. Related Sections:
 - 1. Section 31 20 00: Earthwork: Excavation, Filling and Grading
 - 2. Section 32 12 16: Asphalt Concrete Paving

1.3 SUBMITTALS

- A. Mix Designs: The Contractor shall submit a 'Slurry Seal Surfacing' job-mix formula in accordance with the Standard Specifications for Public Works Construction (GREENBOOK) Section 302-4.2 to the Engineer for approval.
- B. Certificates:
 - 1. Submit certificates of compliance from the supplier for bituminous materials for binder, asphaltic concrete, and tack coat.
 - 2. Submit weigh master's certificates or certified delivery tickets for each truck load of asphaltic material delivered to the project site.

1.4 QUALITY ASSURANCE

- A. The work provided herein shall conform to and be in accordance with the Standard Specifications for Public Works Construction (GREENBOOK), 2024 Edition, adopted by the Southern California Chapter, American Public Works Association; herein referred to as the "Standard Specifications".
- B. The Owner's inspector shall test the temperature of each batch of asphaltic concrete prior to placement. At the time of delivery to the work site, the temperature of mixture shall not be lower than 260 degrees F or higher than 320 degrees F, the lower limit to be approached in warm weather and the higher in cold weather. If asphaltic concrete temperature is not within these tolerances the affected batch shall be rejected. Any and all costs due to the rejected asphaltic concrete shall be the responsibility of the paving contractor.
- C. Asphaltic Concrete Producers Qualifications: Use only materials furnished by a bulk asphaltic concrete producer regularly engaged in production of hot mix, hot laid bituminous concrete.
- D. Applicator Qualifications: Paving machine and roller operators shall be fully trained and

experienced in the installation of asphaltic concrete paving projects of similar size and complexity.

- E. Regulatory Requirements: The quantity of volatile organic compounds (V.O.C.) used in weed killer, seal coat, primer and other materials shall not exceed the limits permitted under the current regulations of the local authorities having jurisdiction.

1.5 ESTABLISHMENT OF GRADES

- A. The Contractor's Surveyor will set grade stakes. The Surveyor shall be a California registered land surveyor or licensed Civil Engineer. The Surveyor shall be hired and paid by the Contractor and shall be subject to the approval of the Owner. Contractor shall notify the Owner at least 48 hours before staking is to be started. The Owner will determine if work is ready for staking.
- B. All work shall conform to the lines, elevations, and grades shown on the Construction Plans. Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected. Any such variation shall be reported to the Engineer. In the absence of such report, the Contractor shall be responsible for any error in the grade of the finished work.

1.6 ENVIRONMENTAL LIMITATIONS

- A. Do not apply asphalt materials if the substrate is wet or excessively damp or if the following conditions are not met:
 - 1. Tack Coats: Minimum surface temperature of 60 deg F.
 - 2. Emulsion-Aggregate Slurry (EAS): EAS shall not be applied if either the pavement or the ambient temperature is less than 50°F and falling.

PART 2 PRODUCTS

2.1 MATERIALS

- A. *Crack-Sealing*: Materials used to seal cracks prior to Seal Coat application, shall be CalSeal Modified Asphalt joint sealant as manufactured by Henry Inc., Crafcro Polyflex Type 3, or approved equal.
- B. *Aggregate for Emulsion-Aggregate Slurry (EAS)*: Aggregate shall be Type II, conforming to GREENBOOK Section 200-1.7. Application rate shall be 12 – 20 lbs/sq. yard.

- C. *Emulsified Asphalt*: Emulsified asphalt shall be 'PMCQS-1h' conforming to GREENBOOK Table 203-3.4.5 (B), shown below:

TABLE 203-3.4.5 (B): QUICK-SET POLYMER MODIFIED EMULSION (PMCQS-1h)

Property	Test Method	Value	
		Min.	Max.
Tests on emulsion:			
Saybolt Furol Viscosity @ 25 °C, SFS ¹	AASHTO T 59	15	90
Sieve test, %	AASHTO T 59	--	0.30
Storage stability, 1 day, %	AASHTO T 59	--	1
Residue by evaporation, %	AASHTO T 59	60	--
Particle charge	AASHTO T 59	Positive	
Tests on residue by evaporation:			
Penetration, 25 °C	AASHTO T 49	40	90
Ductility, 25 °C, mm	AASHTO T 51	400	--
Elastic Recovery, %	AASHTO T 301	50	--
Softening Point, °F	AASHTO T 53	135	--

1. SFS means Saybolt Furol seconds.

2. PME shall contain a minimum of 2.5 percent polymer by weight of residual asphalt.

- D. Emulsified asphalt and residual asphalt content shall conform to the testing requirements in GREENBOOK Table 302-4.3.2.2, shown below:

TABLE 302-4.3.2.2

	Test Method	Type I	Type II	Type III
Emulsified Asphalt %, by weight of dry aggregate.	—	17-20	14-18	11-15
Residual Asphalt Content, % by weight of dry aggregate ¹ .	ASTM D6307 ¹ or CT 382 ¹	10 min.	7.5 min.	6.5 min.

1. Sample size shall be 500 g minimum.

PART 3 EXECUTION

3.1 CONSTRUCTION

- A. Slurry Seal Construction:
- All work shall be in accordance with Sections 203 and 302 of the Standard Specifications (GREENBOOK), except as noted herein.
 - Slurry seal shall not be placed on any surface, which contains ponded water or excessive moisture in the opinion of the Engineer. If paving operations are in progress and rain or fog forces a shutdown, loaded trucks in transit shall return to the plant, and no compensation will be allowed, therefore. The Contractor shall furnish and use canvas tarpaulins to cover all loads of asphalt from the time that the mixture is loaded until it is discharged from the delivery vehicle, unless otherwise directed in writing by the Engineer
 - Successive courses may be laid upon previously laid courses as soon as the previous course has cooled sufficiently to show no perceivable displacement under equipment or loaded material delivery trucks and a tack coat has been applied.
 - Wherever AC pavement does not terminate against a curb, gutter, or another pavement, the Contractor shall provide and install a redwood or pressure treated

- Douglas fir header at the line of termination.
5. Pavement tolerances: within 1/16-inch of design thickness and 1/16-inch from design elevation.

3.2 FLOOD TESTING

- A. Flood Test: Before acceptance, all pavements shall be water tested to ensure proper drainage as directed by the Inspector. The Contractor shall provide water for this purpose. The flooding shall be done by water tank truck. Depressions where the water ponds to a depth of more than 1/8-inch shall be filled or the slope corrected to provide proper drainage. The edges of the fill shall be feathered and smoothed so that the joint between the fill and the original surface is invisible. No standing water shall remain after 30 minutes on a 70 degree F (or warmer) day.

3.3 FIELD QUALITY CONTROL

- A. All paving shall drain properly before being accepted. Upon completion, the pavement shall be true to grade and cross section. The asphalt substrate shall not vary from the planned cross slope by more than ± 0.04 . When a 10-foot straightedge is laid on the finished surface of the asphalt, the surface shall not vary from the edge of the straightedge more than 1/8 inch, except at grade breaks. Where paving does not meet these tolerances, the paving material shall be repaired by a method determined by the Owner. Repairs shall not be made to pavement surface by featheredging at the join lines. All expenses for pavement repair up shall be borne by the Contractor at NO cost to the Owner.
- B. Corrective Measures: It is the Contractor's responsibility to determine if the planarity, cross slopes, and general specifications have been met. If all of the conditions have been met the Contractor must notify the Owner in writing of the acceptance of the asphalt paving.

3.4 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.5 CLEAN UP

- A. Clean all debris and unused materials from the paving operation. Clean all surfaces that have been spattered or defaced as a result of the paving operation. Asphalt or asphalt stains which are noticeable upon surfaces of concrete, or materials which will be exposed to view, shall be promptly and completely removed. Cleaning shall be done in a manner that will not result in any discharge of contaminated materials into any catch basin. All expenses for cleanup shall be borne by the Contractor at NO cost to the Owner.

END OF SECTION 32 12 16

SECTION 32 13 13 CONCRETE PAVING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The Contractor shall furnish all materials for concrete in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other work as required to produce finished concrete, in accordance with the requirements of the Contract Documents.
- B. Provide curb cuts meeting the accessibility requirements of the California Code of Regulations (CCR) Title 24, Part 2, 1127B.5, and ramps complying with CCR, T24, CCR, Part 2, 1003.3.4 and 11B-406.
- C. Portland cement concrete paving shall be stable, firm, and slip resistant and shall comply with CBC Sections 11B-302 and 11B-403.
- D. The following types of concrete shall be covered in this Section:
 - 1. Portland cement concrete pavement, cement walks, flatwork, curbs, gutters, retaining curbs, swales, trash pick-up areas, ramps, mowing strips, fence post footings, sliding gate concrete, catch basins, pipe bedding and encasements, transition structures, flagpoles and light standard bases and footings, splash blocks, parking bumpers and equipment pads.
- E. Reference Standards:
 - 1. UU-B-790: Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellant and Fire Resistant).
 - 2. ACI 301: Specifications for Structural Concrete for Buildings.
 - 3. ACI 318: Building Code Requirements for Reinforced Concrete.
 - 4. ASTM C31: Practices for Making and Curing Concrete Test Specimens in the Field.
 - 5. ASTM C33: Specification for Concrete Aggregates.
 - 6. ASTM C39: Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 7. ASTM C40: Test Method for Organic Impurities in Fine Aggregates for Concrete.
 - 8. ASTM C42: Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - 9. ASTM C78: Specification for Flexural Strength.
 - 10. ASTM C88: Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate.
 - 11. ASTM C94: Specification for Ready-Mixed Concrete.
 - 12. ASTM C114: Method for Chemical Analysis of Hydraulic Cement.
 - 13. ASTM C131: Test Method for Resistance to Degradation of Small- Sized Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - 14. ASTM C136: Method for Sieve Analysis of Fine and Coarse Aggregate.
 - 15. ASTM C143: Test Method for Slump of Portland Cement Concrete.
 - 16. ASTM C150: Specification for Portland Cement.
 - 17. ASTM C156: Test Method for Water Retention by Concrete Curing Materials.
 - 18. ASTM C157: Test Method for Length Change of Hardened Hydraulic Cement Mortar

- and Concrete.
19. ASTM C172: Specification for Sampling Fresh Concrete.
 20. ASTM C192: Method of Making and Curing Concrete Test Specimens in the Laboratory.
 21. ASTM C260: Specification for Air-Entraining Admixtures for Concrete.
 22. ASTM C311: Method for Sampling and Testing Fly Ash or Natural Pozzolans for Use as Mineral Admixture in Portland Cement Concrete.
 23. ASTM C494: Specification for Chemical Admixtures for Concrete.
 24. ASTM C618: Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement.
 25. ASTM C979: Specification for Pigments for Integrally Colored Concrete.
 26. ASTM C1549: Method for Determination of Solar Reflectance.
 27. ASTM D1751: Specification for Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
 28. ASTM E119: Method for Fire Test of Building Construction and Materials.

1.3 SUBMITTALS

- A. Submittals shall be made in accordance with General Requirements.
- B. The following submittals and specific information shall be provided:
 1. Mix Designs - Prior to beginning the work, the Contractor shall submit to the Engineer, for review, and approval, preliminary concrete mix designs for each class and type of concrete specified herein. The mix designs shall be designed by an independent testing laboratory acceptable to the Engineer. All costs related to such mix design shall be borne by the Contractor:
 - a. Each concrete mix submittal shall contain the following information:
 - 1) Slump on which the design is based.
 - 2) Total gallons of water per cubic yard.
 - 3) Brand, type, composition and quantity of cement.
 - 4) Brand type, composition and quantity of fly ash.
 - 5) Specific Gravity and gradation of each aggregate.
 - 6) Ratio of fine to total aggregate per cubic yard.
 - 7) Weight (surface dry) of each aggregate per cubic yard.
 - 8) Brand, type, and ASTM designation, active chemical ingredients and quantity of each admixture.
 - 9) Copy of the Building and Safety Research Report Approval for each concrete admixture.
 - 10) Air content.
 - 11) Compressive strength based on 7 day and 28 day compression tests, including standard deviation calculations, corroborative data (if applicable), and required average comprehensive strength per ACI 318, Section 5.
 - 12) Time of initial set.
 - 13) Certification stamp and signature by a Civil or Structural engineer registered in state of California.
 - 14) Certificate of Compliance for Cement.
 - 15) Test Data: ASTM C1549 Solar Reflectance. Submit test reports of proposed mix certifying solar reflectance meets project requirements.
 2. Certified Delivery Tickets: Where ready-mix concrete is used, the Contractor shall provide certified weighmaster delivery tickets at the time of delivery of each load of concrete. Each certificate shall show the public weighmaster's signature, and the total quantities, by weight of cement, sand, each class of aggregate, admixtures, and the amounts of water in the aggregate and added at the batching plant as well as the amount of water allowed to be added at the site for the specific design mix. Each certificate shall, in addition, state the mix number, total yield in cubic yards, and the

- time of day, to the nearest minute, corresponding to when the batch was dispatched, when it left the plant, when it arrived at the job, the time that unloading began, and the time that unloading was finished.
3. When a water reducing admixture is to be used, the Contractor shall furnish mix designs for concrete both with and without the admixture.
 4. The Contractor shall furnish a Certificate of Compliance signed by the supplier identifying the type of fly ash and stating that the fly ash complies with ASTM C618 and these Specifications, together with all supporting test data prior to the use of the fly ash the sample represents. The supporting data shall also contain test results confirming that the fly ash in combination with the cement and water to be used meets all strength requirements and is compatible with air- entraining agents and other admixtures.
 5. The Contractor shall submit to the Engineer for review the design mix for fly ash concrete together with the design mix for portland cement (non-fly ash) concrete as specified in this Section.

1.4 QUALITY ASSURANCE

- A. Testing for Portland Cement Concrete shall be sampled and tested in accordance with the ASTM and California Tests listed in the Standard Specifications for Public Works Construction, Current Edition, Section 201-1.1.5.
- B. Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, or not less than once for each 50 cubic yards of concrete, or not less than once for each 2,000 square feet of surface area for slabs. Additional samples for seven-day compressive strength tests shall be taken for each class of concrete at the beginning of the concrete work or whenever the mix or aggregate is changed.
- C. The cost of all laboratory tests on cement, aggregates, and concrete, will be borne by the Contractor.
- D. Concrete for testing shall be supplied by the Contractor at no cost to the Owner, and the Contractor shall provide assistance and facilities to the Inspector in obtaining samples, and disposal and cleanup of excess material.
- E. Curbs and gutters shall be staked by a Land Surveyor licensed to practice in the State of California.
- F. Job Mock-Up:
 1. General:
 - a. Make samples on-site; revise as required; obtain Architect's approval, 10 days prior to casting finished work.
 - b. Finished work to match approved samples.
 - c. Approved sample may be incorporated into the work. Retain samples until completion of all concrete work.
 - d. Include typical tooled joint control in sample.
 2. Color Cured Hardened Slab; Interior Slab-On-Grade: Provide sample, 20 s.f. minimum area.
 3. Broom Finished Concrete; Exterior Flatwork: Provide sample, 20 s.f. minimum area.
 4. "Sacked" Vertical Surface; Exterior Wall: Provide sample, 5 sf. minimum area.
- G. Construction Tolerances: The Contractor shall set and maintain concrete forms and perform finishing operations so as to ensure that the completed work is within the tolerances specified herein. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance is the specified permissible variation from lines, grades, or dimensions shown.

- H. Construction tolerances shall not violate dimensions, grades, slopes required by CBC for accessibility requirements. Adjust work accordingly to comply with requirements.
- I. The following construction tolerances are hereby established and apply to finished walls and slab unless otherwise shown:

Item	Tolerance
Variation of the constructed linear outline from the established position in plan.	In 10 feet: 1/8-inch; In 20 feet or more: 1/4-inch
Variation from the level or from the grades shown.	In 10 feet: 1/8-inch; In 20 feet or more: 1/4-inch
Variation from the plumb	In 10 feet: 1/8-inch; In 20 feet or more: 1/4-inch
Variation in the thickness of slabs and walls.	Minus 1/8-inch; Plus 1/4-inch
Variation in the locations and sizes of slabs inch and wall openings.	Plus or minus 1/8

PART 2 PRODUCTS

2.1 MATERIALS

- A. Materials shall be delivered, stored, and handled so as to prevent damage by water or breakage. Only one brand of cement shall be used. Cement reclaimed from cleaning bags or leaking containers shall not be used. All cement shall be used in the sequence of receipt of shipments.
- B. All materials furnished for the work shall comply with the requirements of ACI 301, as applicable.
- C. Storage of materials shall conform to the requirements of Section 205 of ACI 301.
- D. Form Materials - Plywood, metal, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces:
 - 1. Use flexible or curved forms for curves of a 100-foot or less radius.
 - 2. Wood form material, profiled to suit conditions:
 - a. Materials shall be free from defects which would impair the appearance of structural quality of the completed work
 - b. Provide stakes and bracing materials as required to hold forms securely in place.
- E. Reinforcing Materials:
 - 1. Steel Reinforcing Bars: ASTM A615/A615M deformed grade 80 (80,000 psi) yield strength billet steel, unfinished, unless otherwise specified on Construction Document. Fabrication, sampling and jobsite handling shall conform to the requirements in ASTM Designation D3963, except the 2 samples shall be 30 inches long.
 - 2. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in flat sheets; unfinished.
 - 3. Dowels:
 - a. Dowel bars shall be plain round smooth conforming to the requirements in ASTM Designation A615/A615M, Grade 60 (60,000 psi) yield strength, except that the two

samples required in ASTM Designation D3963/D3963M shall be 18 inches long. Dowel bars shall be free from burrs or other deformations detrimental to free movement of the bars in the concrete.

- b. Dowel bars shall be lubricated with a bond breaker over the entire bar. A bond breaker application of petroleum paraffin based lubricant or white- pigmented curing compound shall be used to coat the dowel bars completely prior to placement. Oil and asphalt based bond breakers shall not be used. Paraffin based lubricant shall be Dayton Superior DSC BB-Coat or Valvoline Tectyl 506 or an approved equal. Paraffin based lubricant shall be factory applied. White pigmented curing compound shall conform to the requirements of ASTM Designation C309, Type 2, Class A, and shall contain 22 percent minimum nonvolatile vehicles consisting of at least 50 percent paraffin wax. Curing compound shall be applied in 2 separate applications, the last application not more than 8 hours prior to placement of the dowel bars. Each application of curing compound shall be applied at the approximate rate of one gallon per 15 square yards.
4. Epoxy for bonding tie bars and dowel bars to portland cement concrete shall be a two-component, epoxy-resin, conforming to the requirements of ASTM Designation C881, Type V, Grade 3 (Non-Sagging), Class B or C. The class used shall be dependent on the internal temperature of the hardened concrete at the time the epoxy is to be applied. Class B shall be used when the internal temperature is from 40 °F to 60 °F. Class C shall be used when the internal temperature is above 60 °F, but not higher than recommended by the manufacturer. A copy of the manufacturer's recommended installation procedure shall be provided to the Engineer at least 7 days prior to the start of work. Epoxy shall be applied in conformance with the manufacturer's recommendations:
 - a. Simpson Strong Tie Set-XP Epoxy (or approved equal) ICC-ES ESR- 2508.

F. Concrete Materials:

1. Provide in accordance with State of CA Highways (CalTrans) standards.
2. Site concrete shall be standard brand portland cement conforming to ASTM C150, 80% Type II or Type V with 15% Class F fly ash. A water-reducing admixture conforming to section 2.01, part G.4 herein must also be used. A single brand of cement shall be used throughout the work, and prior to its use, the brand shall be acceptable to the Engineer. The cement shall be suitably protected from exposure to moisture until used. Cement that has become lumpy shall not be used. Sacked cement shall be stored in such a manner so as to permit access for inspection and sampling. Certified mill test reports for each shipment of cement to be used shall be submitted to the Inspector.
3. Concurrent with strength design criteria, concrete shall also be proportioned to provide the requisite durability to satisfy the exposure conditions imposed by either environment and/or service. Durability, in this context, refers to the ability of the concrete to resist deterioration from the environment or service in which it is placed. Concrete proportioned in accordance with ACI 318, chapter 4, Durability Requirements, will meet this criteria.
4. Combined Aggregate: 1" maximum coarse aggregate size conforming to Grading C of Standard Specifications Section 201-1.3.2(A). Aggregates shall be obtained from pits acceptable to the Inspector, shall be non-reactive, and shall conform to ASTM C33.
5. Water: Shall be potable, clean, and free from objectionable quantities of silty organic matter, alkali, salts and other impurities. The water shall be considered potable, for the purposes of this Section only, if it meets the requirements of the local governmental agencies.
6. **"Pea gravel" mix is not acceptable**, unless specifically approved in writing by the Civil Engineer of Record prior to construction.

G. Admixtures:

1. The Engineer may require the use of admixtures or the Contractor may propose to use admixtures to control the set, effect water reduction, and increase workability. In either case, the addition of an admixture shall be at the Contractor's expense. The use and continued use of an admixture shall be approved by the Engineer. Admixtures specified herein, other than calcium chloride, shall conform to the requirements of ASTM C494. The required quantity of cement shall be used in the mix regardless of whether or not an admixture is used. Admixtures shall contain no free chloride ions, be non-toxic after 30 days, and shall be compatible with and made by the same manufacturer as the air entraining admixture.
2. These admixtures shall not be used in greater doses than those recommended by the manufacturer or permitted by the Engineer. The permitted dosage of the admixture shall not exceed that which will result in an increase in the drying shrinkage of the concrete in excess of 20 percent when used in precast or prestressed concrete, or 10 percent when used in any other structural concrete. The strength of concrete containing the admixture in the amount of proposed shall, at the age of 48 hours and longer be not less than that of similar concrete without the admixture. The admixture shall not adversely affect the specified air content, unless permitted by the Engineer.
3. Set controlling admixture shall be either with or without water-reducing properties. Where the air temperature at the time of placement is expected to be consistently over 80 degrees F, a set retarding admixture such as [Sika Chemical Corporation's Plastiment], [Master Builder's Pozzolith 300R], or equal shall be used. Where the air temperature at the time of placement is expected to be consistently under 40 degrees F, a set accelerating admixture such as [Sika Chemical Corporation's Plastocrete 161FL], [Master Builder's Pozzolith 50C], or equal shall be used.
4. Low range water reducer shall conform to ASTM C494, Type A. It shall be either a hydroxylated carboxylic acid type or a hydroxylated polymer type. The quantity of admixture used and the method of mixing shall be in accordance with the manufacturer's instructions and recommendations.
5. High range water reducer shall be sulfonated polymer conforming to ASTM C494, Type F or G:
 - a. If the high range water reducing agent is added to the concrete at the batch plant, it shall be second generation type, Pozzolith 430R, as manufactured by Masterbuilders; or equal. High range water reducer shall be added to the concrete after all other ingredients have been mixed and initial slump has been verified.
 - b. If the high range water reducer is added to the concrete at the job site, it shall be used in conjunction with a low range water reducer and shall be WRDA 19 and WRDA 79, as manufactured by W.R. Grace & Co.; or equal. Concrete shall have a slump of 3-inches \pm 1/2- inch prior to adding the high range water reducing admixture at the job site. The high range water reducing admixture shall be accurately measured and pressure injected into the mixer as a single dose by an experienced technician. A standby system shall be provided and tested prior to each day's operation of the job site system.
6. Air-entraining agent meeting the requirements of ASTM C260, shall be used. Sufficient air-entraining agent shall be used to provide a total air content of 3 to 4 percent; provided that, when the mean daily temperature in the vicinity of the worksite falls below 40 degrees F for more than one day, the total air content provided shall be 5 to 6 percent. The Owner reserves the right, at any time, to sample and test the air-entraining agent received on the job by the Contractor. The air-entraining agent shall be added to the batch in a portion of the mixing water. The solution shall be batched by means of a mechanical batcher capable of accurate measurement.
7. Calcium Chloride: Except as otherwise provided herein, calcium chloride will not be permitted to be used in concrete.
8. Fly ash/pozzolan shall conform to ASTM C618 and the following supplementary requirements:
 - a. Class F Fly Ash:

- 1) Loss on ignition: maximum 4 percent.
 - 2) SO₃ content: maximum 3 percent.
 - 3) Moisture content: maximum 1 percent.
- b. Class F fly ash, as a percent by weight of total cementitious material, shall not exceed 15 percent.
- c. When Sulfate Resistant or Special Exposure Concrete is specified, test results shall be submitted to the Engineer as specified in Section 2-5.3 of the Standard Specifications. The test result shall show that the fly ash to be used is effective in contributing to sulfate resistance in conformance with ASTM C618, Table 3 (optional physical requirements) as tested in accordance with ASTM C1012. The data submitted shall be less than 6 months old.

H. Curing Materials:

1. Concrete curing compound shall conform to the requirements of ASTM C309 Type 1 – clear or translucent without dye, Class A – no type restrictions, except the loss of water shall not exceed 0.15 kilograms per square meter in 24 hours nor 0.45 kilograms per square meter in 72 hours when tested in accordance with ASTM C156. The Contractor shall provide, when requested by the Engineer, certified copies of vendor's test report showing compliance with ASTM C309 and these specifications. The testing and the report shall be supplied without cost to the Agency. All compounds shall be furnished by the Contractor in sealed original containers labeled in accordance with ASTM C309 and with the date of manufacture.
2. Polyethylene sheet for use as concrete curing blanket shall be white and conform to ASTM C171. The loss of moisture when determined in accordance with the requirements of ASTM C156 shall not exceed 0.055 grams per square centimeter of surface.
3. Polyethylene-coated burlap for use as concrete curing blanket shall conform to ASTM C171. The loss of moisture, when determined in accordance with the requirements of ASTM C156, shall not exceed 0.055 grams per square centimeter of surface.

I. Expansion Joint Filler Material:

1. Curb & Gutter: Nonextruding and Resilient Filler: Celotex "Flexcell", or approved equal, 1/4-inch thick material conforming to ASTM D1751.
2. Concrete Walk and Slab: Joint filler material shall be preformed expansion joint filler conforming to the requirements of ASTM D994. A Certificate of Compliance for the joint filler material shall be furnished to the Engineer. The certificate shall be accompanied with a certified test report of the results of the required tests performed on the joint filler material within the previous 12 months prior to proposed use. The certificate and accompanying test report shall be provided for each lot of joint filler material prior to use on the project.
3. Silicone Joint Sealant - Premium-grade, high-performance, moisture-cured, single-component, polyurethane-based, non-sag elastomeric sealant. Meets Federal specification TT-S-00230C. Meets ASTM C920, Type S, Class 25 or 35; Grade NS, Use T or NT, Shore A Hardness (21 day) 35-45. A Certificate of Compliance for the silicone sealant shall be furnished to the Engineer. The Certificate shall also be accompanied with a certified test report of the results of the required tests performed on the sealant material within the previous 12 months prior to proposed use. The Certificate and accompanying test report shall be provided for each lot of silicone joint sealant prior to use on the project:
 - a. Sika Corporation, Sikaflex-1A.
 - b. Tremco, Inc., Dymonic.
 - c. Tremco, Inc., Vulkem 116.
 - d. Bostik Construction Products Div., Chem-Calk 900.

J. Concrete Sealer: For natural color concrete only, HLQ-125 as manufactured by SINAK

Corp., San Diego, CA (619/231-1771), HLQ-125 as manufactured by SINAK Corp., San Diego, CA (619/231-1771), or equivalent product of another manufacturer in accordance with the "or equal" provision of the Contract Documents, penetrating sealer that interacts with mineral compounds and siliceous materials in portland cement concrete to produce more dense, non-dusting surface.

- K. Related Materials:
1. Damp-proofing agent shall be an asphalt emulsion, such as Sonneborn Hydrocide 660, or equal.
 2. Epoxy adhesives shall be the following products for the applications specified:
 - a. For bonding freshly-mixed, plastic concrete to hardened concrete, Sikadur Hi-Mod Epoxy Adhesive, as manufactured by Sika Chemical Corporation or equal.
 - b. For bonding hardened concrete or masonry to steel, Sikadur Hi-Mod Gel, or equal.

2.2 CONCRETE MIX DESIGN

- A. Concrete Mix Design In Heavy Duty Areas - At a minimum, site concrete in heavy duty areas (as noted on grading plan) shall conform to the Standard Specifications for Public Works Construction, Section 201-1.1.2, mix class 650-CLE-4000P:
1. Compressive Strength: Minimum of 4,000 psi at 28 days compressive strength.
 2. Slump Limit: 4 inches at point of placement.
 3. Cement per cu yard (sacks): 6.9 (minimum).
 4. Air Content: 4% +/- 1% percent.
 5. Verifiable Solar Reflectance: 0.30 (ASTM C1549).
- B. Concrete Mix Design In Light Duty Areas - At a minimum, site concrete in light duty areas (as noted on grading plan) shall conform to the Standard Specifications for Public Works Construction, Section 201-1.1.2, mix class 520-C-2500:
1. Compressive Strength: Minimum of 2,500 psi at 28 days compressive strength.
 2. Slump Limit: 4 inches at point of placement.
 3. Cement per cu yard (sacks): 5.5 (minimum).
 4. Air Content: 4% +/- 1% percent.
 5. Verifiable Solar Reflectance: 0.30 (ASTM C1549)
- C. Slurry Mix Design:
1. Compressive Strength: 100 psi at min. 28 days compressive strength.
 2. Slump Limit: 5 inches at point of placement.
 3. Cement per cu yard (sacks): 1.0
 4. Aggregate Gradation: "E" per S.S.P.W.C. table 201-1.3.2(A).
 5. Air Content: 4% +/- 1% percent.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACES FOR CONCRETING

- A. General: Earth surfaces shall be thoroughly wetted by sprinkling, prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.
- B. Aggregate base material shall be installed in layers not exceeding 4-inches and compacted to a minimum of 95% relative density.
- C. Subgrade Preparation:

1. It is required that the native soil, and/or imported fill material, below the new aggregate base, be over excavated to the recommended minimum depth of 24 inches. Refer to section 13.2.2 of the soils report for recompaction requirements. The extent and depths of removal should be evaluated by Geotechnical representative in the field based on the materials exposed. Additional removals may be recommended if loose or soft soils are exposed during grading.
 2. Prior to placement of engineered fill, the subgrade shall be scarified to a depth of at least 8 inches, moisture conditioned and recompacted to a minimum 90% relative density.
- D. The compacted surface shall be firm, hard and unyielding. The term "firm, hard and unyielding" as used in S.S.P.W.C. Section 301-1.3 shall mean that when the heaviest construction and hauling equipment used on the project drives over the subgrade, no permanent deformation shall occur either before or during pavement construction. On areas where the underlying material appears to be wet or soft, or where it deflects under wheel loads, the Contractor shall employ excavation and work techniques which do not worsen the subgrade condition.
- E. The above subgrade preparation recommendations are based on the assumption that soils encountered during field exploration are representative of soils throughout the site. However, there can be unforeseen and unanticipated variations in soils between points of subsurface exploration. For this reason, the actual over-excavation depths will have to be determined on the basis of in-grading observations and testing performed by representatives of the project geotechnical consultant.
- F. A California Licensed Surveyor (LS) must provide grade stakes and elevations for the Geotechnical Engineer to verify that any over-excavation depths, shown on the construction drawings for concrete pavement structural sections, have been achieved prior to re-compaction.
- G. Joints in Concrete: Concrete surfaces upon or against which concrete is to be placed, where the placement of the old concrete has been stopped or interrupted so that, as determined by the Engineer, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of horizontal joints shall be given a compacted, roughened surface for good bond. Except where the Drawings call for joint surfaces to be coated, the joint surfaces shall be cleaned of all laitance, loose or defective concrete, and foreign material. Such cleaning shall be accomplished by sandblasting followed by thorough washing. All pools of water shall be removed from the surface of construction joints before the new concrete is placed.
- H. Embedded Items: No concrete shall be placed until all formwork, installation of parts to be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and accepted by the Inspector at least 24 hours before placement of concrete. All surfaces of forms and embedded items that have become encrusted with dried grout from concrete previously placed shall be cleaned of all such grout before the surrounding or adjacent concrete is placed.
- I. All inserts or other embedded items shall conform to the requirements herein.
- J. All reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms where shown or by shop drawings and shall be acceptable to the Inspector before any concrete is placed. Accuracy of placement is the responsibility of the Contractor.
- K. Where concrete is to be cast against old concrete, (greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by sand-blasting,

exposing the aggregate. In concrete shear-walls, suspended slabs and roof slabs, the interface surface at construction joints shall be roughened to a full amplitude of one quarter inch. The hardened surface shall be cleaned of all latent foreign material and washed clean, prior to the application of an epoxy bonding agent.

- L. No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the work. No concrete shall be deposited underwater nor shall the Contractor allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, will be subject to the review of the Engineer.
- M. Corrosion Protection: Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2-inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.
- N. Openings for pipes, inserts for pipe hangers and brackets, and the setting of anchors shall, where practicable, be provided for during the placing of concrete.
- O. Anchor bolts shall be accurately set, and shall be maintained in position by templates while being embedded in concrete.
- P. Cleaning: The surfaces of all metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.

3.2 HANDLING, TRANSPORTING, AND PLACING

- A. General: Placing of concrete shall conform to the applicable requirements of ACI 301 and the requirements of this Section.
- B. The total elapsed time between the addition of water at the batch plant and the completion of the discharge of the concrete from the mixer shall not exceed 90 minutes. All concrete remaining in the mixer after said 90-minute time limit shall be rejected and removed from the project site.
- C. Non-Conforming Work or Materials: Concrete which upon or before placing is found not to conform to the requirements specified herein shall be rejected and immediately removed from the work. Concrete which is not placed in accordance with these Specifications, or which is of inferior quality, shall be removed and replaced by and at the expense of the Contractor.
- D. Whenever batch trucks or other paving equipment cause rutting of the subgrade or subbase in concrete placement areas, inspectors shall immediately stop construction. Construction shall not be allowed to resume until distorted subgrade or subbase is repaired. Contractors and inspectors should locate by proof rolling, any questionable unstable areas in advance to avoid distortion under equipment. Wet, unstable areas must be dried out or replaced before starting placement of asphalt. Locating wet or soft areas in advance can be accomplished by testing finished subgrade or subbase with a loaded truck. Construction of concrete pavement should not proceed unless testing gives a reasonable indication that distortions

will not occur during construction of overlying pavement. When repair, aeration, and recompaction are required to correct damage from Contractor's operation, all necessary repair will be done at Contractor's expense. However, if the Engineer determines that additional depth of aeration and recompaction are needed, that should be paid by change order.

- E. All pull boxes, meter boxes, valve covers and manholes shall be adjusted to proposed finish grade prior to placement of the concrete.
- F. Dowel Placement:
 - 1. Dowel bars shall be centered on the joint within a tolerance of ± 2 inches in the longitudinal direction directly over the contact joint or sawcut for the transverse weakened plane joints, as shown on the plans. Prior to placement of dowel bars, the Contractor shall submit to the Engineer a written procedure to identify the transverse weakened plane joint locations relative to the middle of the dowel bars and the procedure for consolidating concrete around the dowel bars.
 - 2. Dowel bars shall be placed at longitudinal joints as shown on the plans. Dowel bars shall be placed as shown on the plans by using mechanical insertion. When dowel bars are placed by mechanical insertion, the concrete over the dowel bars shall be reworked and refinished so that there is no evidence on the surface of the completed pavement that there has been any insertion performed. When drill and bonding of dowel bars is performed at contact joints, a grout retention ring shall be used.
- G. Concrete shall not be placed until the forms and reinforcement have been inspected, all preparations for the placement have been completed, and the preparations have been checked by the project inspector, all subject to the observation of the engineer or architect.
- H. Casting New Concrete Against Old: An approved epoxy adhesive bonding agent shall be applied to the old surfaces according to the manufacturer's written recommendations. This provision shall not apply to joints where waterstop is installed.
- I. Conveyor Belts and Chutes: All ends of chutes, hopper gates, and all other points of concrete discharge throughout the Contractor's conveying, hoisting and placing system shall be so designed and arranged that concrete passing from them will not fall separated into whatever receptacle immediately receives it. Conveyor belts, if used, shall be of a type acceptable to the Inspector. Chutes longer than 50 feet will not be permitted. Minimum slopes of chutes shall be such that concrete of the specified consistency will readily flow in them. If a conveyor belt is used, it shall be wiped clean by a device operated in such a manner that none of the mortar adhering to the belt will be wasted. All conveyor belts and chutes shall be covered. Sufficient illumination shall be provided in the interior of all forms so that the concrete at the places of deposit is visible from the deck or runway.
- J. Placement in Slabs: Concrete placed in sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the pour. As the work progresses, the concrete shall be vibrated and carefully worked around the slab reinforcement, and the surface of the slab shall be screeded in an up-slope direction.
- K. Temperature of Concrete: The temperature of concrete when it is being placed shall be not more than 90 degrees F nor less than 40 degrees F in moderate weather, and not less than 50 degrees F in weather during which the mean daily temperature drops below 40 degrees F. Concrete ingredients shall not be heated to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, from falling below the specified minimum temperature. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F, the Contractor shall employ effective means, such as precooling of aggregates and mixing water using ice or placing at night, as

necessary to maintain the temperature of the concrete, as it is placed, below 90 degrees F. The Contractor shall be entitled to no additional compensation on account of the foregoing requirements.

- L. Cold Weather Placement: Earth foundations shall be free from frost or ice when concrete is placed upon or against them. Fly ash concrete shall not be placed when the air temperature falls below 50 degrees F.
- M. A transverse construction joint shall be constructed, including dowel bars, at the end of each day's work or where concrete placement is interrupted for more than 30 minutes, to coincide with the next contraction joint location. If sufficient concrete has not been mixed to form a slab to match the next contraction joint, when an interruption occurs, the excess concrete shall be removed and disposed of back to the last preceding joint. The cost of removing and disposing of excess concrete shall be at the Contractor's expense. Excess material shall become the property of the Contractor and shall be disposed of. A metal or wooden bulkhead (header) shall be used to form the joint. The bulkhead shall be designed to accommodate the installation of dowel bars.
- N. Broom Finish Type:
 - 1. Surfaces Sloped Less than 6%: Provide a medium salt (medium broom) finish by drawing a soft bristle broom across concrete surface, perpendicular to line of traffic, to provide a uniform fine line texture.
 - 2. Surfaces Sloped greater than 6%: Provide a slip resistant (heavy broom finish) by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
 - 3. Joints in concrete curb, gutter, and walk shall be designated as expansion joints and control joints. Joints for concrete flatwork shall be provided every eight (8) feet or less. Expansion joints for swales, curbs / curb & gutter shall be placed at no greater than 24 feet on center or as indicated on construction drawings:
 - a. Expansion Joints - Provide 1/2" premolded joint filler, material meeting Section 2.01I herein. Construct expansion joints in conformance with Standard Specification Section 303-5.4.2 and the details on the construction documents:
 - 1) Extend expansion joint fillers full-width and depth of joint, and 1/4" below finished surface where joint filler is indicated. If no joint sealer is called for, place top of premolded joint filler flush with top of concrete or curb.
 - 2) Where silicone joint sealer is noted on the construction documents, the premolded joint filler strips shall be placed 1" below the surface of the concrete or curb, the full width of the expansion joint. The remainder of all joints shall be filled to within 1/4" below the surface of the concrete with the silicone joint sealant.
 - 3) Provide expansion joint filler strips, with elastomeric sealer, between p.c.c. walk and curb, p.c.c. walk and buildings, & p.c.c. walk and retaining walls and at locations noted on the construction documents. The depth of the filler strip shall be the depth of the p.c.c. walk plus 1 inch with the top set flush with the specified grade of the top of curb or walk.
 - b. Control Joints:
 - 1) Control joints in site work concrete shall comply with Standard Specification Section 302-6.5.4, except that the configuration of the joint, shall be as indicated on the construction documents.
 - 2) Control joints in concrete curbs, sidewalks and gutters shall comply with Standard Specification Section 303-5.4.3, except that the joint configuration shall be as indicated below.
 - 3) Location: As shown on construction documents, but in any case not more than eight (8) feet O.C. both ways in concrete sidewalks. In swales and

gutters, including gutter integral with curb, joints shall be at regular intervals not exceeding five (5) feet. Where integral curb and gutter is adjacent to concrete pavement, the joint shall be aligned with the pavement joints where practical.

- O. Protection: In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control film. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.

3.3 TAMPING AND VIBRATING

- A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted, throughout the entire depth of the layer which is being consolidated, into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete during placement. Vibrators shall be high speed power vibrators (8000 to 10,000 rpm) of an immersion type in sufficient number and with (at least one) standby units as required.
- B. Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that all air and rock pockets have been eliminated. Where flat-strip type waterstops are placed horizontally, the concrete shall be worked under the waterstops by hand, making sure that all air and rock pockets have been eliminated. Concrete surrounding the waterstops shall be given additional vibration, over and above that used for adjacent concrete placement to assure complete embedment of the waterstops in the concrete.
- C. Concrete in walls shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and closes snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly as specified. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the results herein specified within 15 minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall be kept from contact with the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents.

3.4 CURING

- A. Comply with 2022 California Building Code, Title 24, Part 2, Volume 2, Section 1905A.11:
 - 1. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven (7) days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- B. Curing Methods - Perform curing of concrete by curing as herein specified:
 - 1. Provide moisture-curing by the following methods:
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Continuous water-fog spray.
 - c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4 inch lap over adjacent absorptive covers.
 - 2. Provide curing and sealing compound to exposed exterior slabs, walks, and curbs, as follows:
 - a. Apply specified curing and sealing compound to concrete slabs as soon as final

- finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Re-coat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
- b. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid, floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to Architect.
- C. Concrete slabs and paving shall be properly cured and protected against damage and defacement of nature during construction operations. If weather is hot or surface has dried out, spray surface with fine mist of water starting not later than two hours after final troweling. Surface of finish shall be kept continuously wet for at least ten days. Wetting is considered emergency work and shall be performed on weekends and holidays if necessary.
- D. Concrete Sealer Application - Apply specified concrete sealer in continuous operation in accordance with manufacturer's instructions and recommendations:
1. Prior to starting application, protect adjoining Work, including sealant bond surfaces, from spillage or blow-over of concrete sealer:
 - a. Cover adjoining and nearby surfaces of aluminum and glass where there is the possibility of the concrete sealer being deposited on surfaces.
 - b. Cover live plants and grass.
 - c. Immediately clean concrete sealer from adjoining surfaces, complying with manufacturer's cleaning recommendations.
 2. Apply concrete sealer under temperature conditions according to manufacturer's instructions.
 3. Apply concrete sealer in light, even coats using garden sprayer, airless sprayer or paint brush.
 4. Apply concrete sealer at rate to suit porosity of portland cement concrete but not less than no more than coverage rates recommended by manufacturer for effective sealing of surface.
- E. The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the Contractor's expense. Exclude traffic from concrete paving for at least 7 days after placement.
- F. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

3.5 PUMPING OF CONCRETE

- A. General: If the pumped concrete does not produce satisfactory end results, the Contractor shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

- B. Pumping Equipment: The pumping equipment must have 2 cylinders and be designed to operate with one cylinder only in case the other one is not functioning. In lieu of this requirement, the Contractor may have a standby pump on the site during pumping.
- C. The minimum diameter of the hose (conduits) shall be 4-inches.
- D. Pumping equipment and hoses (conduits) that are not functioning properly, shall be replaced.
- E. Aluminum conduits for conveying the concrete will not be permitted.
- F. Proportioning: Minimum compressive strength, cement content, and maximum size of aggregates shall be as specified herein.
- G. Gradation of coarse aggregates shall conform to ASTM C33 and shall be as close to the middle range as possible.
- H. Gradation of fine aggregate shall conform to ASTM C33, with 15 to 30 percent passing the number 50 screen and 5 to 10 percent passing the number 100 screen. The fineness modulus of sand used shall not be over 3.00.
- I. Water and slump requirements shall conform to the requirements of this Section.
- J. Cement and admixtures shall conform to the requirements of this Section.
- K. Field Control: Concrete samples for slump per ASTM C143 and test cylinders per ASTM C31 and C39.

3.6 TREATMENT OF SURFACE DEFECTS

- A. As soon as forms are removed, all exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the Engineer. In no case will extensive patching of honeycombed concrete be permitted. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall have them repaired as specified herein. Concrete containing extensive voids, holes, honeycombing, or similar depression defects, shall be completely removed and replaced:
 - 1. All repairs and replacements herein specified shall be promptly executed by the Contractor at its own expense.
- B. Defective surfaces to be repaired shall be cut back from true line a minimum depth of 1/2-inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of all laitance or soft material, and not less than 1/32-inch depth of the surface film from all hard portions, by means of an efficient sandblast. After cutting and sandblasting, the surface shall be wetted sufficiently in advance of shooting with shotcrete or with cement mortar so that while the repair material is being applied, the surfaces under repair will remain moist, but not so wet as to overcome the suction upon which a good bond depends. The material used for repair purposes shall consist of a mixture of one sack of cement to 3 cubic feet of sand. For exposed walls, the cement shall contain such a proportion of Atlas white portland cement as is required to make the color of the patch match the color of the surrounding concrete.

- C. Holes left by tie-rod cones shall be reamed so as to leave the surfaces of the holes clean and rough. These holes then shall be repaired in an approved manner with non-shrink grout. Holes left by form-tying devices having a rectangular cross-section, and other imperfections having a depth greater than their least surface dimension, shall not be reamed but shall be repaired in an approved manner with non-shrink grout.
- D. All repairs shall be built up and shaped in such a manner that the completed work will conform to the requirements of this Section, as applicable, using approved methods which will not disturb the bond, cause sagging, or cause horizontal fractures. Surfaces of said repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.
- E. Prior to filling any structure with water, all cracks that may have developed shall be repaired to the satisfaction of the Engineer. This repair method shall be done on the water bearing face of members. Prior to backfilling, faces of members in contact with fill, which are not covered with a waterproofing membrane, shall also have cracks repaired as specified herein.
- F. The finished surface shall be free from humps, sags, blemishes or other irregularities.

3.7 FIELD QUALITY CONTROL

- A. Correction of Mix Design for Failed Concrete Tests: If the compressive cylinder strength test for in place PCC yields test results below the specified 28-day PCC compressive strength and the Engineer determines a corrective change is necessary, the Contractor shall, at its own expense, make corrective changes in the mix proportions. The Engineer shall approve the changes in the mix proportions or PCC placement procedures, before any additional PCC is placed on the job.
- B. Flood Tests: Before final acceptance, and after concrete has thoroughly cured, all concrete pavement, including swales and curb & gutter, shall be water tested to ensure proper drainage as directed by the Inspector. The Contractor shall provide water for this purpose. The flooding shall be done by water tank truck. Concrete work where water ponds and does not run off in a reasonable amount of time (1-hour), shall be removed to the nearest score or joint line and replaced to provide proper drainage. Full compensation for complying with this requirement shall be considered as included in the Contract Unit Price for cement concrete pavement.

3.8 CARE AND REPAIR OF CONCRETE

- A. General: The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the Contractor's expense.
- B. The contractor shall barricade and protect placed Portland Cement Concrete from all damage, marks, mars and/or graffiti. Any Portland Cement Concrete damaged, defaced, discolored or defective shall be replaced at the contractor's expense.

END OF SECTION 32 13 13

SECTION 32 13 15 SITE CONCRETE IMPROVEMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY:

- A. This Section includes the following:
 - 1. All material, labor, equipment and services necessary to completely install exterior Portland cement flatwork, cast-in-place concrete, and architectural flatwork concrete, accessories and other related items, slabs, ramps and sidewalks and walkways, curb and gutter, mow strips, and other miscellaneous concrete items of the form and dimensions shown on the plans and necessary to complete the project, and in accordance with the requirements of the Standard Specifications as modified and supplemented by these Special Provisions
 - 2. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to the work of this section.
- B. RELATED SECTIONS:
 - 1. Section 31 20 00 - Earthwork: Excavation, Filling, and Grading
 - 2. Section 32 11 26 - Aggregate Base Course.
 - 3. Section 32 13 15 - Concrete Reinforcement

1.3 REFERENCES

- A. Standard Specifications for Public Works Construction (GREENBOOK)
- B. ACI standards, including but not limited to #304, 305, 306, 308, 309 and 347.
- C. ASTM standards, including but not limited to #C-33, C-39, C-94, C-136, C-143, C-150, and C-309.

1.4 SUBMITTALS

- A. Submit under provisions of Specification Section SUBMITTALS.
 - 1. Concrete Mix Design
 - 2. Load tags for delivered material.
 - 3. Compressive strength testing as required by the approving agency.
 - 4. Application instructions for the architectural materials.
 - 5. Accessories and manufacturer's installation specifications.

1.5 QUALITY ASSURANCE

- A. Furnish concrete materials conforming with GREENBOOK Sections 200 and 201.
- B. Perform work in accordance with GREENBOOK Section 303.

PART 2 - PRODUCTS

2.1 MIXES

PART 3 - EXECUTION

3.1 PREPARATION

- A. Subgrade shall conform to the requirements of Division 31 Specification Section EARTHWORK: EXCAVATION, FILLING AND GRADING. The District may elect to verify compacted subgrade elevations by measurement made from adjacent existing improvements or by a template supported by forms.

3.2 GENERAL CONCRETE

- A. Concrete placement shall conform to the applicable requirements of Standard Specification Sections 51 and 90. Concrete shall not be placed when the air temperature in the shade at the project site exceeds 95° F or is below 45° F, or when the temperature of the concrete exceeds 85° F.
- B. After the concrete has been placed, it shall be struck off to proper section and compacted with a grid of parallel metal bars until a layer of mortar not less than 3/8 inch thick has been brought to the surface. All exposed concrete surfaces shall receive a medium broom finish applied transversely to the line of pedestrian traffic or to the longest dimension of the concrete, as applicable.
- C. General concrete surfaces shall be cured by the curing compound method and shall be protected in accordance with the provisions of Subsections 90-1 and 90-2 of the Standard Specifications.

3.3 PROTECTION OF CONCRETE

- A. The Contractor shall be responsible for the condition of all concrete work until such time as all work has been completed and is accepted by the District. The Contractor shall limit vehicular travel across concrete until such time as the concrete has achieved sufficient strength that it can support traffic without damage. In no case, however, will vehicles be allowed to travel across new concrete improvements until seven calendar days have passed since the concrete was placed.

3.4 CONCRETE JOINTS

- A. Expansion joints and weakened plane joints shall be constructed at the locations shown on the plans or as directed by the Engineer. Where joint locations are not specified on the plans, expansion joints shall be constructed at maximum intervals not exceeding 30 feet, and weakened plane joints shall be constructed at maximum intervals of 10 feet.
- B. Expansion joints shall be considered as weakened plane joints for the purpose of spacing weakened plane joints. Expansion joints shall be tooled with a 1/4-inch maximum radius edger, and shall be filled with 3/8 inch pre-formed expansion joint filler.

3.5 CONCRETE FINISHES

- A. Where concrete is being installed adjacent to or near existing concrete improvements, match the finish of similar concrete surfaces (i.e. new sidewalks shall match existing sidewalks, new curbs shall match existing curbs, etc.).

- B. Sidewalks and Mow strips: Medium sweat finish or medium broom finish perpendicular to the direction of travel.
- C. Curbs: Trowel smooth and finish with a light brush.
- D. Gutters: Medium broom finish parallel with curb or direction of flow.
- E. Drive approaches and wheelchair ramps: medium broom finish, perpendicular to the direction of travel.

3.6 INSTALLATION OF ACCESSORIES

- A. Strictly comply with the manufacturer's instructions and recommendations and approved details. Securely anchor work to substrate.

3.7 REPAIR AND CLEAN-UP

- A. Contractor shall legally remove all trash, debris, containers and excess materials from the site on a periodic basis and shall keep the work broom clean until Owner's acceptance.
- B. The Contractor shall be held responsible for the repair and/or replacement of new or existing improvements damaged as a result of this work to the satisfaction of the Owner.
- C. The Contractor shall provide roll-off bins for wash-out of ready-mix concrete trucks and pumers. Do not allow concrete debris or cement water onto soils scheduled for landscape planting.

END OF SECTION 32 13 13

SECTION 32 17 23 PAVEMENT MARKINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Parking lot markings, including parking bays, arrows, handicapped symbols, and curb markings.
- B. Related Section:
 - 1. Section 32 12 16: Asphalt Paving.
- C. Reference Standards:
 - 1. CBC Chapter 11B - California Building Code - Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
 - 2. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

1.3 DEFINITIONS

- A. Pavement Stripe: Includes traffic control, materials, and all appurtenances not otherwise specified.
- B. Pavement Markings: Includes traffic control, setup, materials, and all appurtenances not otherwise specified in the bid schedule.

1.4 SUBMITTALS

- A. See Special Provisions for Submittal Requirements.

1.5 QUALITY ASSURANCE

- A. Accessible Parking:
 - 1. Accessible parking spaces serving a particular building or facility shall be located on the shortest accessible route to an entrance complying with CBC Section 11B-208.3.1.
 - 2. Accessible parking spaces serving more than one accessible entrance shall be dispersed and located on the shortest accessible route to the accessible entrances.
 - 3. 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. See CBC Section 11B-208.3.1.
 - 4. Minimum number of required accessible parking spaces shall be provided in accordance with CBC Table 11B-208.2 for each parking facility provided on a site.
 - 5. For every six, or fraction of six, accessible parking spaces, at least one shall be an accessible van parking space. See CBC Section 11B-208.2.4.
 - 6. 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:
 - a. 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 slopes not steeper than 1:48 in any direction. See CBC Section 11B-502.4:
- b. Parking spaces shall be 9 feet x 18 feet minimum, and van parking spaces shall be 12 feet by 18 feet minimum with an adjacent access aisle of 5 feet by 19 feet 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 feet by 19 feet minimum where the access aisle is 8 feet by 18 feet minimum.
 - c. Access aisles shall be marked by a blue painted borderline around their perimeters. The area within the blue borderlines shall be marked with hatched lines a maximum of 36 inches 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. See CBC Section 11B-502.3.3.
 - d. Access aisles (accessible parking spaces as well – similar application) shall not overlap the vehicular way. See CBC Section 11B-502.3.4.
 - e. A vertical clearance of 8 feet 2 inches minimum shall be provided for accessible parking spaces, access aisles, and vehicular routes serving them. See CBC Section 11B-502.5.
7. 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 Sections 11B-209 and 11B-503 as follows:
- a. Vehicle pull-up spaces shall be 8 feet by 20 feet minimum.
 - b. Access aisles shall be 5 feet wide minimum x full length of vehicle pull-up spaces. They shall be at the same level with each other and with slopes not steeper than 1:48 in any direction. Access aisle shall adjoin an accessible route and shall not overlap the vehicular way.
 - c. Access aisles for passenger drop-off and loading zone shall be marked with a painted borderline around their perimeters. The area within the borderlines shall be marked with hatched lines a maximum of 36 inches on center in a color contrasting with that of the aisle surface: Blue interior hatch lines are preferred for concrete surfaces and white interior hatch lines are preferred for asphalt surfaces. Where white hatch lines are used, hatch lines shall be interrupted at 12 inches high “No Parking” text so that legibility is maintained.
 - d. A vertical clearance of 9 feet 6 inches minimum shall be provide for vehicle pull-up spaces, access aisles, and a vehicular route serving them connecting a vehicular entrance and a vehicular exit. See CBC Section 11B-503.5.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Traffic Paint:
 1. Type: Water base, roadway traffic lane marking type; colors as selected.
 2. Acceptable Manufacturers:
 - a. Dunn-Edwards, Vin-L-Stripe No. W-801, vinyl-epoxy as a standard of quality.

- b. J. E. Bauer latex base Formula No. 1030A9 White, No. 1056A9 Yellow, No. 1865A9 Blue, No. 1118A9 Green, and No. 1854A9 Red.
 - c. Sinclair No. 160 Vinyl Traffic Line Paint, waterbase.
 - d. Ennis Traffic Safety Solutions, product 6000 white & 6006 blue.
- B. Line and Zone Marking Paint - MPI (APL) No. 97 Latex Traffic Marking Paint; white:
 - 1. Roadway Markings: As required by authorities having jurisdiction.
 - 2. Handicapped Symbols: Blue.
- C. Striping: Thermoplastic Stripe, In accordance with State of California, Department of Transportation (CALTRANS), Standard Specifications, Section 84.
- D. Pavement Markings: Thermoplastic Markings, In accordance with State of California, Department of Transportation (CALTRANS), Standard Specifications, Section 84.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

3.2 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.

3.3 JOB CONDITIONS

- A. Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.
- B. Sequencing, Scheduling: Coordinate with paving work. Verify that paint type is compatible with asphalt paving surfaces seal coats.
- C. Protection: Do not apply pavement markings for seven days after application of asphalt surface seal coat. After application, protect from traffic until thoroughly dry.

3.4 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.
- 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.

3.5 INSTALLATION

- A. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.
- B. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.
- C. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends:
 - 1. Apply paint in one coat only.
 - 2. Wet Film Thickness: 0.015 inch, minimum.
 - 3. Width Tolerance: Plus or minus 1/8 inch.
- D. 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.

3.6 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 District.

END OF SECTION 32 17 23

SECTION 32 18 23 INFIELD FOR SOFTBALL FIELDS

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

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide infield mix materials.

1.2 RELATED WORK

- A. Earthwork. Section 31 20 00

1.3 QUALIFICATIONS

- A. Natural Turf Contractor Qualifications. Section 32 92 31

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Infield.

1. “Red Infield Dirt”. This material shall be a red sandy clay loam mixture. All of the soil used in the skinned area shall pass through a 3/8-inch wire screen. A minimum of 97% should pass through a number 8 sieve, and of the remaining 97%, at least 60% should pass through a number 140 sieve.

Infield Gradation.

Soil	%
Sand	60%-80%
Silt	10%-20%
Clay	15%-20%

2. Infield Conditioner.
“Diamond Pro Red Infield Conditioner” or approved substitution.
3. Infield Top Dressing.
“Diamond Pro Calcined Clay Top Dressing” or approved substitution.

- B. Home Plate and Pitchers Circle. Batters box, catchers’ box and pitchers circle shall be a screened clay loam with a rich red color. Mixture of sand, silt and clay shall be in approximate equal retained percentage proportions. Use “Diamond Pro Home Plate/Mound Clay” or approved equivalent material.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Provide written verification that infield Sub-grade and Sub-grade Drains are in place and properly compacted, and to grade before proceeding with installation of infield and warning track materials.

3.2 INSTALLATION

A. Infield.

1. Turf Contractor shall have laid out the skinned infield, excavated the area to Subgrade elevations, and installed wooden form boards on all dirt perimeters prior to installation of the infield materials.
2. Infield. Red Infield dirt material shall be back dumped onto the Subgrade and spread by track mounted tractor to a thickness of 4-1/2" (compacted). The red infield dirt shall be graded using automated hydraulically actuated laser guided equipment. Compact topping material by thoroughly wetting.
3. Infield Conditioner. After infield material is compacted in place and to grade, infield conditioner 1-1/2" thick (compacted) shall be applied to the 4-1/2" of infield material. Thoroughly blend the total 6" of Red infield dirt and Infield Conditioner and compact. The infield should then be screen dragged to game ready conditions. The infield should then be rolled using a 2-4 ton double barrel roller.
4. Infield Dressing. The Infield Top Dressing shall then be applied evenly covering the infield material. With a lightweight screen drag the field should be dragged to final game ready conditions.
5. Home Plate and Pitchers Circle. Install clay loam soil in the batters' box, catchers box and pitchers circle to a depth of 9" to finish grade. Clay loam soil shall be compacted to 95% maximum density ASTM-D698.

- B. All finish surfaces on infield shall be to elevations shown on the drawings and smooth graded.

END OF SECTION 32 18 23

SECTION 32 31 13
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 RELATED SECTIONS

- A. Section 03 30 00: Cast-In-Place Concrete.

1.3 REFERENCES

- A. ASTM International (ASTM)
 - 1. A392, Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
 - 2. F567, Standard Practice for Installation of Chain Link Fence
 - 3. F626, Standard Specification for Fence Fittings
 - 4. F900, Standard Specification for Industrial and Commercial Swing Gates
 - 5. F1083, Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded for Fence Structures

1.4 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's schedules, charts, literature, and illustrations indicating the performance, fabrication procedures, product variations and accessories indicating material compliance and specified options.
 - 2. Manufacturer's installation instructions.
- B. Shop Drawings: Indicate materials, dimensions, details, and finish, show locations and installation procedures. Include details of fence and gate joints, attachments, accessories, footings, and clearances.

1.5 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with applicable requirements.
 - 1. Americans with Disability Act of 1990, as amended.
 - 2. CBC 20122 California Building Code. CCR Title 24, Part 2, as adopted and amended by DSA.
 - 3. Gates to meet all applicable accessible specifications for doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Specifications are based on products of Anchor Fence by Master Halco Inc., Baltimore, MD, (800) 229-5615.

- B. Other manufacturers must have a minimum of five (5) years' experience manufacturing chain link fencing and gates meeting or exceeding the following specifications for design, size, gauge, finish of metal parts and fabrication and comply with Division 1 requirements for substitutions in order to be considered.
1. Alcorn Fence Co., Sun Valley Branch, Sun Valley, CA 91352 (323) 875-1342
 2. La Habra Fence Company, La Habra, CA (562) 697-4216

2.2 CHAIN LINK FENCE MATERIALS

- A. Fence Fabric:
1. Hot dipped galvanized after weaving with a minimum zinc coating weight per ASTM A392, Class I with weight of zinc coating not less than 1.2 oz./ft² of uncoated wire surface.
 2. Size: Helically wound and woven to height of six (6) feet, eight (8) feet and/or ten (10) feet as specified on plans where indicated with one (1) inch diamond shaped mesh, black, with core wire diameter of 0.148 inch (9 gauge) and a break-load of 1,290 lbs. per ft.
 3. Selvage of fabric shall be knuckled at top and knuckled at bottom.
- B. Fence Framing:
1. Standard weight Schedule 40 pipe, ASTM F1083 with minimum yield strength of 25,000 psi; sizes as indicated below. Hot-dipped galvanized with minimum average 1.8 oz./ft² of coated surface area.
 - a. Line posts: 2 inch o.d, weighing 2.72 lbs./ft.
 - b. Terminal, End, Corner, and Pull Posts: 2-1/2 inch o.d., weighing 3.65 lbs./ft.
 - c. Rails and Braces: 1-5/8 inch o.d., weighing 2.27 lbs./ft.
- C. Fence Accessories:
1. Chain Link Fence Accessories: Provide items required to complete fence system. Galvanize each ferrous metal item and finish to match framing.
 2. Post Caps: Formed steel, cast malleable iron, or aluminum alloy weathertight closure cap for tubular posts. Provide one (1) cap for each post. (Where top rail is used, provide tops to permit passage of top rail.)
 3. Brace Rail Ends: Formed steel, malleable or cast iron, for connection of brace to terminal posts.
 4. Wire Ties: 9 gauge galvanized steel wire for attachment of fabric to line posts. Double wrap 13 gauge for rails and braces. Hog ring ties of 12-1/2 gauge for attachment of fabric to tension wire.
 5. Brace and Tension (Stretcher Bar) Bands: Pressed steel.
 6. Tension (Stretcher) Bars: One piece lengths equal to 2 inches less than full height of fabric with a minimum cross-section of 3/16 inch x 3/4 inch or equivalent fiber glass rod. Provide tension (stretcher) bars where chain link fabric meets terminal posts.
 7. Tension Wire: 7 gauge, diameter core wire with tensile strength of 75,000 psi.
 8. Truss Rods: Steel rods with minimum diameter of 5/16 inch.
 9. Fasteners: Galvanized nuts and bolts.

2.3 CHAIN LINK SWING GATES

- A. Gate Frames: Fabricate chain link swing gates in accordance with ASTM F900 using galvanized steel tubular members, 2 inches round, and weighing 2.60 lbs./ft. Fusion or stainless steel welded connections forming rigid one-piece unit.
- B. Chain Link Fence Fabric: Same as specified above for fence. Install fabric with hook bolts and

tension bars at all four (4) sides. Attach to gate frame at not more than 15 inches on center.

- C. Hardware Materials: Hot dipped galvanized steel or malleable iron shapes to suit gate size.
 - 1. Hinges: Structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180 degrees inward.
 - 2. Latch: Forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.
 - 3. Keeper: Provide keeper for each gate leaf over five (5) feet wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.
 - 4. Drop Rod: Provide at double gates to hold inactive leaf. Provide gate stop pipe to engage center drop rod. Provide locking device and padlock eyes as an integral part of latch, requiring one (1) padlock for locking both gate leaves.
- D. Gate Posts: Steel pipe, ASTM F1083, standard weight Schedule 40; minimum yield strength of 25,000 psi. Hot-dipped galvanized with minimum 1.8 oz./ft² of zinc. Sizes as follows:
 - 1. Width for single gate or one gate leaf of double gates:
 - a. 6 feet or less: 2.875 inches in diameter, weighing 5.79 lbs./ft.
 - b. Over 6 feet to 12 feet: 4.00 inches in diameter, weighing 9.11 lbs./ft.
 - c. Over 12 feet to 19 feet: 6.625 inches in diameter, weighing 18.97 lbs./ft.
 - d. Over 19 feet to 23 feet: 8.625 inches in diameter, weighing 28.55 lbs./ft.

2.4 SETTING MATERIALS

- A. Concrete: Minimum 28 day compressive strength of 3,000 psi.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify areas to receive fencing are completed to final grades and elevations.
- B. Ensure property lines and legal boundaries of work are clearly established.

3.2 CHAIN LINK FENCE FRAMING INSTALLATION

- A. Install chain link fence in accordance with ASTM F567 and manufacturer's instructions.
- B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30 degrees or more.
- C. Space line posts uniformly at 10 feet on center.
- D. Concrete fence post footings:
 - 1. Drill holes in firm, undisturbed or compacted soil. Excavate deeper than specified below as required for adequate support in soft and loose soils, and for posts with heavy lateral loads.
 - 2. Line posts shall be set in 9 inch minimum diameter concrete piers, with a minimum of 36 inches of post embedment in concrete with an additional 3 inch concrete cover at bottom.
 - 3. All end, corner, and pull posts shall be set in minimum 12 inch minimum diameter concrete piers, with a minimum of 36 inches of post embedment in concrete with an additional 3 inch concrete cover at bottom or as indicate on Drawings.

4. Place concrete around posts in a continuous pour.
 5. Trowel finish around post. Slope to direct water away from posts.
- E. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.
 - F. Bracing: Install horizontal pipe brace at mid-height for fences six (6) and over, on each side of terminal posts. Firmly attach with fittings. Install diagonal truss rods at these points. Adjust truss rod, ensuring posts remain plumb.
 - G. Tension Wire: Provide tension wire at bottom of fabric. Install tension wire before stretching fabric and attach to each post with ties. Secure tension wire to fabric with 12-1/2 gauge hog rings 24 inches on center.
 - H. Top Rail: Install lengths, 21 feet. Connect joints with sleeves for rigid connections for expansion/contraction.
 - I. Bottom Rails: Install bottom rails between posts with fittings and accessories.

3.3 CHAIN LINK FABRIC INSTALLATION

- A. Fabric: Install fabric on security side and attach so that fabric remains in tension after pulling force is released. Leave approximately 2 inches between finish grade and bottom selvage. Attach fabric with wire ties to line posts at 15 inches on center and to rails, braces, and tension wire at 24 inches on center.
- B. Tension (stretcher) bars: Pull fabric taut; thread tension bar through fabric and attach to terminal posts with bands or clips spaced maximum of 15 inches on center.

3.4 ACCESSORIES

- A. Tie Wires: Bend ends of wire to minimize hazard to persons and clothing.
- B. Fasteners: Install nuts on side of fence opposite fabric side for added security.

3.5 CHAIN LINK SWING GATE POST INSTALLATION

- A. Install gate posts in accordance with manufacturer's instructions.
- B. Concrete gate post footings:
 1. Drill holes in firm, undisturbed or compacted soil. Excavate deeper than specified below as required for adequate support in soft and loose soils, and for posts with heavy lateral loads.
 2. All gate posts shall be set in minimum 12 inch diameter concrete piers, with a minimum of 36 inches of post embedment in concrete with an additional 3 inch concrete cover at bottom.
 3. Place concrete around posts in a continuous pour.
 4. Trowel finish around post. Slope to direct water away from posts.
- C. Gate posts and hardware: Set keeper, stops, sleeves into concrete. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.

3.6 GATE INSTALLATION

- A. Install gates plumb, level, and secure for full opening without interference.
- B. Attach hardware by means which will prevent unauthorized removal.
- C. Adjust hardware for smooth operation.

3.7 CLEANING

- A. Clean up debris and unused material, remove from the site.

END OF SECTION 32 31 13

SECTION 32 31 13.34 SPORTS FIELD BARRIER NETTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Provide netting and suspension members for Sports Field Barrier netting. Including support pole structure as detailed on Drawings.
- B. Provide portable ball netting system. Include detailed drawings and storage space requirements.
- C. Related Sections:
 - 1. Section 05 50 00: Metal Fabrications.

1.3 SUBMITTALS

- A. Product data and installation drawings:
 - 1. Include data on netting layout and support brackets.
 - 2. Poles locations and sizes.
 - 3. Cable selection and supports.
 - 4. Acceptable means of connection to chain link fencing, including hardware.

1.4 QUALITY ASSURANCE

- A. Work of this section shall be performed by a firm with a minimum of five years' experience in installing sports netting.

PART 2 PRODUCTS

2.1 SUPPLIER / MANUFACTURER

- A. West Coast Netting, Inc., 1 (800) 854-5741, 5075 Flightline Dr., Kingman, AZ 86401.
- B. Carron Net Company Inc., (920) 793-2217 Phone, (800) 558-7768, (920) 793-2122 Fax, 1623 17th Street / P.O. Box 177, Two Rivers, WI 54241
- C. Aluminum Athletic Equipment, 1000 Enterprise Drive, Royersford, PA 19468. (800) 523-5471 (610) 825-2378.
- D. Midwest Cover, 6463 Waveland Street, Unit A, Hammond, IN 46320. (800) 594-0744.
- E. Or approved equal.

2.2 COMPONENTS – PERIMETER SPORTS NETTING SYSTEM

- A. Netting. 1-3/4 inch square, #36 knotted multi-strand nylon with enhanced UV treatment. Net color shall be black

- B. Rope and Twine. Pre-shrunk black nylon, treated for UV protection; 3/8-inch diameter rope with 2,500 lbs. tensile strength; #48 twine with 380 lbs. tensile strength.
- C. Hardware. Stainless Steel 3/8-inch aircraft cable with 15,000 lbs. tensile strength. Cable clips, shackles, eyebolts, turn-buckles, etc. shall all be galvanized.
- D. Support Poles. Hot dipped galvanized steel poles per drawings.

2.3 COMPONENTS – PERIMETER OPAQUE NETTING

- A. Vision screen: Vinyl coated polyester windscreen
- B. Opacity: 80%
- C. Weight: 9.0 oz per sq. yd.
- D. Tensile strength:
 - 1. Grab: 230 lbs x 200 lbs
 - 2. Strip: 200 lbs x 140 lbs
- E. Color: Black
- F. Location: where indicated on drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install net tight, without sags or puckering.
- B. Sharp edges and burrs on cable will not be acceptable.
- C. Inspect work to ensure that balls cannot fit between edge of net and adjacent surfaces.
- D. Provide field anchor spikes, min 4 per-section for portable netting.
- E. Grind smooth all metal edges prior to paint.
- F. Paint post school colors or as noted by District.

END OF SECTION 32 31 13.34

SECTION 32 31 19 DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section relates to Ornamental Fence Systems.
- B. Related Sections:
 - 1. Section 03 30 00: Cast-in-Place Concrete.
- C. System Description:
 - 1. The contractor shall provide all labor, materials and appurtenances necessary for installation of the welded ornamental steel fence system defined herein.
 - 2. The system shall include all components (i.e., panels, posts, gates and hardware) required.
- D. Reference Standards:
 - 1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
 - 3. ASTM D523 - Test Method for Specular Gloss.
 - 4. ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.
 - 5. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
 - 6. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
 - 7. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
 - 8. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.
 - 9. ASTM 6695 – Standard Practice for Xenon-Arc Exposures of Paint and Related Coatings
 - 10. ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets

1.3 SUBMITTALS

- A. Shop Drawings - Submit shop drawings detailing the 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:
 - 1. For installed products indicated to comply with design loads, include structural analysis data, for information only, signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Delegated Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding certificates.

- D. Paint Compatibility Certificates: Submit manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.4 QUALITY ASSURANCE

- A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.
- B. Accessibility Requirements for Fences, Gates, and Hardware:
 - 1. Gates that are part of the accessible route shall meet all the requirements of an accessible door in compliance with CBC Section 11B-404.
 - 2. The levers of lever actuated latches or locks for accessible gates shall be curved with a return to within ½ inch of the gate surfaces to prevent catching on the clothing or persons. See California Referenced Standards Code T-24, Part 12, Section 12-10-202, Item (F).
 - 3. Swing doors and gate surfaces within 10 inches of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16 inch of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped. See CBC Section 11B-404.2.10.

1.5 PRODUCT WARRANTY

- A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.
- B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of original purchase.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

PART 2 MATERIALS

2.1 MANUFACTURER

- A. The fence system basis of design conform to Impasse II, 3-Rail style manufactured by **Ameristar Fence Products, Inc.**, Tulsa, Oklahoma.

2.2 MATERIAL

- A. Steel material for fence framework (i.e. corrugated pales, rails, and posts), when galvanized prior to forming, shall conform to the requirements of ASTM A924/A924M, with a minimum yield strength of 45,000 psi. The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz./sq. ft. Coating designation G-90.

- B. Material for corrugated pales shall be a nominal 2.75" x .75" x14 Ga. The cross-sectional shape of the rails shall conform to the manufacturer's Impasse II rail design a nominal 2" x 2" x 11 Ga. Pre-drilled holes in the Impasse II rail shall be spaced 6" on center, providing a pale airspace of no greater than 3.25" for standard air space and 1.375" for anti-scale spacing. Tamperproof grounding fasteners shall be used to fasten each pale to rail at every intersection as well as rail to I-Beam. Posts shall conform to the manufacturer's Impasse II I-Beam design with a nominal 3" x 2.75" x 12 Ga. for fence panel heights up to & including 8' height and/or Impasse II I-Beam design with a nominal 4" x 2.75" x 11 Ga. for fence heights greater than 8' up to 10' panel height. Fence posts and gate posts shall meet the minimum size requirements of Table 1.
- C. Material for steel Impasse II privacy screening shall be 18ga. preformed slats, providing complete screening coverage between pales and at pale to post connections. Impasse II privacy screening shall provide screening from top rail to bottom rail and be capable of traversing terrain without impeding the raking capabilities of the fencing panel.

2.3 FABRICATION

- A. Pedestrian gates 4 feet or less shall have accessible hardware complying with CBC 11B-404.2.7 and 11B-309.4.
- B. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept tamperproof security fasteners.
- C. The manufactured galvanized framework shall be subjected to the PermaCoat thermal stratification coating process (high temperature, in-line, multi-stage, multi-layer) including as a minimum a six-stage pretreatment/was

PART 3 EXECUTION

3.1 PREPARATION

- A. All new installation shall be laid out by the contractor in accordance with the construction plans.

3.2 FENCE INSTALLATION

- A. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete per details in the drawings.

3.3 FENCE INSTALLATION MAINTENANCE

- A. When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces:
 - 1. Remove all metal shavings from cut area.
 - 2. Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry.
 - 3. Apply 2 coats of custom finish paint matching fence color.
- B. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures' warranty.

3.4 GATE INSTALLATION

- A. Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacturer of the gate and shall be installed per manufacturer's recommendations.

3.5 CLEANING

- A. The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

END OF SECTION 32 31 19

SECTION 32 84 00 PLANTING IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY

- A. It is the intent of the specifications and drawings that the finished system is complete in every respect and shall be ready for operation satisfactory to the Owner.
- B. The work shall include all materials, labor, services, transportation, and equipment necessary to perform the work as indicated on the drawings, in these specifications, and as necessary to complete the contract.

1.2 CONSTRUCTION DRAWINGS

- A. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves, etc. which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, and architectural features.
- B. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications. When an item is shown on the plans but not shown on the specifications or vice versa, it shall be deemed to be as shown on both. The Landscape Architect shall have final authority for clarification.
- C. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Landscape Architect as soon as detected. In the event this notification is not performed, the Irrigation Contractor shall assume full responsibility for any revision necessary.

1.3 QUALITY ASSURANCE

- A. Provide at least one English speaking person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the manufacturer's recommended methods of installation and who shall direct all work performed under this section.
- B. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturer of articles used in this contract furnish directions covering points not shown in the drawings and specifications.
- C. All local, municipal, and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

- D. All materials supplied for this project shall be new and free from any defects. All defective materials shall be replaced immediately at no additional cost to Owner.
- E. The Contractor shall secure the required licenses and permits including payments of charges and fees, give required notices to public authorities, verify permits secured or arrangements made by others affecting the work of this section.

1.4 SUBMITTALS

- A. Submittals Materials List:
 - 1. After award of contract and before any irrigation system materials are ordered from suppliers or delivered to the job site, submit to the Owner a complete list of all irrigation system materials, or processes proposed to be furnished and installed as part of this contract.
 - 2. The submittals materials list shall include the following information:
 - a. A title sheet with the job name, the contractor's name, contractor's address and telephone number, submittal date and submittal number.
 - b. An index sheet showing the item number (i.e. 1,2,3, etc.); an item description (i.e. sprinkler head); the manufacturer's name (i.e. Hunter Industries); the item model number (i.e. I-40-ADV/36V); and the page(s) in the submittal set that contain the catalog cuts.
 - c. The catalog cuts shall be one or two pages copied from the most recent manufacturer's catalog that indicate the product submitted. Do not submit parts lists, exploded diagrams, price lists or other extra information.
 - d. The catalog cuts shall clearly indicate the manufacturer's name and the item model number. The item model number, all specified options and specified sizes shall be circled on the catalog cuts.
 - e. Submittals for equipment indicated on the legend without manufacturer names, or "as approved", shall contain the manufacturer, Class or Schedule, ASTM numbers and/or other certifications as indicated in these specifications.
 - 3. Submittal materials list format requirements:
 - a. Submittals shall be provided as one complete package for the project. Multiple partial submittals will not be reviewed.
 - b. Submittal package shall be stapled or bound in such a way as to allow for disassembly for review processing. Submittals shall not have tabs, tab sheets, spiral binding, or any other type of binding that will interfere with automated copying of submittals.
 - c. Submittal package shall have all pages numbered in the lower right hand corner. Page numbers shall correspond with submittal index.
 - d. Re-submitted packages must be revised to include only the equipment being re-submitted. Equipment previously reviewed and accepted shall not be re-submitted in the materials list/index sheet or in the catalog cut sheet package.
- B. Substitutions: If the Irrigation Contractor wishes to substitute any equipment or materials for those equipment or materials listed on the irrigation drawings and specifications, he may do so by providing the following information to the Landscape Architect or Owner's authorized representative for approval.
 - 1. Provide a written statement indicating the reason for making the substitution.
 - 2. Provide catalog cut sheets, technical data, and performance information for each substitute item.
 - 3. Provide in writing the difference in installed price if the item is accepted.
- C. The Landscape Architect or Owner's authorized representative will allow no substitutions without prior written acceptance.

- D. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.
- E. The Landscape Architect or Owner's authorized representative will not review the submittal package unless provided in the format described above.

1.5 EXISTING CONDITIONS

- A. The Contractor shall verify and be familiar with the locations, size and detail of points of connection provided as the source of water, and electrical supply to the irrigation system.
- B. Irrigation design is based on the available static water pressure shown on the drawings. Contractor shall verify static water on the project prior to the start of construction. Should a discrepancy exist, notify the Landscape Architect and Owner's authorized representative prior to beginning construction.
- C. Prior to cutting into the soil, the Contractor shall locate all cables, conduits, sewer septic tanks, and other utilities as are commonly encountered underground and he shall take proper precautions not to damage or disturb such improvements. If a conflict exists between such obstacles and the proposed work, the Contractor shall promptly notify the Landscape Architect and Owner who will arrange for relocations. The Contractor will proceed in the same manner if a rock layer or any other such conditions are encountered.
- D. The Contractor shall protect all existing utilities and features to remain on and adjacent to the project site during construction. Contractor shall repair, at his own cost; all damage resulting from his operations or negligence.
- E. The Irrigation Contractor shall coordinate with the General Contractor for installation of required sleeving as shown on the plans prior to paving operations.
- F. The Contractor shall verify and be familiar with the existing irrigation systems in areas adjacent to and within the Project area of work.
- G. The Contractor shall protect all existing irrigation systems, in areas adjacent to and within the project area of work, from damage due to his operations.
- H. Contractor shall notify Owner's Representative if any existing system is temporarily shut off, capped or modified. Provide 48-hour notice, prior to turning off or modifying any existing irrigation system.
- I. The Contractor shall repair or replace all existing irrigation systems, in areas adjacent to and within the project area of work, damaged by the construction of this project. Adjacent irrigation systems shall be made completely operational and provide complete coverage of the existing landscaped areas. All repairs shall be complete to the satisfaction of the Owner's Representative.
- J. The contractor shall provide bore holes under any existing pavement or paving encountered for the required lateral, mainline and low voltage control wire sleeving. Bore holes under 2 inches in diameter and smaller shall be made with a BulletMole® underground boring tool as manufactured by Dimension Tools, LLC (Contact telephone number (888)-650-5554 or at www.bulletmole.com). Bore holes larger than 2 inches in diameter shall be made with an approved mechanical boring tool. No air jacking or hydraulic boring of any kind shall be allowed.

1.6 INSPECTIONS

- A. The Contractor shall permit the Landscape Architect and Owner's authorized representative to visit and inspect at all times any part of the work and shall provide safe access for such visits.
- B. Where the specifications require work to be tested by the Contractor, it shall not be covered over until accepted by the Landscape Architect, Owner's authorized representative, and/or governing agencies. The Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing. Should any work be covered without testing or acceptance, it shall be, if so ordered, uncovered at the Contractor's expense.
- C. Inspections will be required for the following at a minimum:
 - 1. Pre-construction meeting.
 - 2. System layout.
 - 3. Pressure test of irrigation mainline (Four hours at 125 PSI or 120% of static water pressure, whichever is greater.) Mainline pressure loss during test shall not exceed 2 PSI.
 - 4. Coverage test of irrigation system. Test shall be performed prior to any planting.
 - 5. Final inspection prior to start of maintenance period.
 - 6. Final acceptance prior to turnover.
- D. Site observations and testing will not commence without the field record drawings as prepared by the Irrigation Contractor. Record drawings must complete and up to date for each site visit.
- E. Work that fails testing and is not accepted will be retested. Hourly rates and expenses of the Landscape Architect, Owner's authorized representative, and governing agencies for re-inspection or retesting will be paid by the Irrigation Contractor at no additional expense to Owner.

1.7 STORAGE AND HANDLING

- A. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect the installation work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Landscape Architect and Owner and at no additional cost to the Owner.
- B. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings under cover until ready to install. Transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load.

1.8 CLEANUP AND DISPOSAL

- A. Dispose of waste, trash, and debris in accordance with applicable laws and ordinances and as prescribed by authorities having jurisdiction. Bury no such waste material and debris on the site. Burning of trash and debris will not be permitted. The Contractor shall remove and dispose of rubbish and debris generated by his work and workmen at frequent intervals or when ordered to do so by the Owner's authorized representative.
- B. At the time of completion the entire site will be cleared of tools, equipment, rubbish and debris which shall be disposed of off-site in a legal disposal area.

1.9 TURNOVER ITEMS

A. Record Drawings:

1. Record accurately on one set of drawings all changes in the work constituting departures from the original contract drawings and the actual final installed locations of all required components as shown below.
2. The record drawings shall be prepared to the satisfaction of the Owner. Prior to final inspection of work, submit record drawings to the Landscape Architect or Owner's authorized representative.
3. All record drawings shall be prepared using AutoCAD 2010 drafting software and the original irrigation drawings as a base. No manual drafted record drawings shall be acceptable. The Contractor may obtain digital base files from the Landscape Architect or Owner's authorized representative.
4. If the Contractor is unable to provide the AutoCAD drafting necessary for the record drawings the irrigation designer does provide record drawing drafting as a separate service.
5. Prior to final inspection of work, submit record drawings plotted onto vellum sheets for review by the Landscape Architect or Owner's authorized representative. After acceptance by the Landscape Architect, City Inspector or Owner's authorized representative re-plot the record drawings onto reproducible Mylar sheets. The Contractor shall also provide record drawing information on a digital AutoCAD Release 2010 drawing file. All digital files shall be provided on a compact disc (CD) clearly marked with the project name, file descriptions and date.
 - a. Record drawing information and dimensions shall be collected on a day-to-day basis during the installation of the pressure mainline to fully indicate all routing locations and pipe depths. Locations for all other irrigation equipment shall be collected prior to the final inspection of the work.
 - b. Two dimensions from two permanent points of reference such as buildings, sidewalks, curbs, streetlights, hydrants, etc. shall be shown for each piece of irrigation equipment shown below. Where multiple components are installed with no reasonable reference point between the components, dimensioning may be made to the irrigation equipment. All irrigation symbols shall be clearly shown matching the irrigation legend for the drawings. All lettering on the record drawings shall be minimum 1/8 inch in size.
6. Show locations and depths of the following items:
 - a. Point of connection (including water POC, backflow devices, master control valves, flow sensors, etc.)
 - b. Routing of sprinkler pressure main lines (dimensions shown at a maximum of 100 feet along routing)
 - c. Isolation valves
 - d. Automatic remote control valves (indicate station number and size)
 - e. Quick coupling valves
 - f. Drip air relief and flush valves
 - g. Routing of control wires where separate from irrigation mainline
 - h. Irrigation controllers (indicate controller number and station count)
 - i. Related equipment (as may be directed)

B. Controller Charts:

1. Provide one controller chart for each automatic controller. Chart shall show the area covered by the particular controller. The areas covered by the individual control valves shall be indicated using colored highlighter pens. A minimum of six individual colors shall be used for the controller chart unless less than six control valves are indicated.
2. Landscape Architect or Owner's authorized representative must approve record drawings before controller charts are prepared.

3. The chart is to be a reduced copy of the actual "record" drawing. In the event the controller sequence is not legible when the drawing is reduced, it shall be enlarged to a readable size.
 4. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils in thickness.
- C. Operation and Maintenance Manuals:
1. Two individually bound copies of operation and maintenance manuals shall be delivered to the Landscape Architect or Owner's authorized representative at least 10 calendar days prior to final inspection. The manuals shall describe the material installed and the proper operation of the system.
 2. Each complete, bound manual shall include the following information:
 3. Index sheet stating Contractor's address and telephone number, duration of guarantee period, list of equipment including names and addresses of local manufacturer representatives.
 - a. Operating and maintenance instructions for all equipment.
 - b. Spare parts lists and related manufacturer information for all equipment.
- D. Equipment:
1. Supply as a part of this contract the following items:
 - a. Two (2) wrenches for disassembly and adjustment of each type of sprinkler head used in the irrigation system.
 - b. Three 30-inch sprinkler keys for manual operation of control valves.
 - c. Two keys for each automatic controller.
 - d. Two quick coupler keys with a 1" bronze hose bib, bent nose type with hand wheel and two coupler lid keys.
 - e. One valve box cover key or wrench.
 - f. Six extra sprinkler heads of each size and type.
 - g. For specified ball valves if required: One (1) 5-foot long valve handle, to fit the specified ball valves.
 2. The above equipment shall be turned over to Owner's authorized representative at the final inspection.

1.10 COMPLETION

- A. At the time of the pre-maintenance period inspection, the Landscape Architect, Owner's authorized representative, and governing agencies will inspect the work, and if not accepted, will prepare a list of items to be completed by the Contractor. Punch list to be checked off by contractor and submitted to Landscape Architect or Owner's Authorized representative prior to any follow-up meeting. This checked off list to indicate that all punch list items have been completed. At the time of the post-maintenance period or final inspection the work will be re-inspected and final acceptance will be in writing by the Landscape Architect, Owner's authorized representative, and governing agencies.
- B. The Owner's authorized representative shall have final authority on all portions of the work.
- C. After the system has been completed, the Contractor shall instruct Owner's authorized representative in the operation and maintenance of the irrigation system and shall furnish a complete set of operating and maintenance instructions.
- D. Any settling of trenches which may occur during the one-year period following acceptance shall be repaired to the Owner's satisfaction by the Contractor without any additional expense to the Owner. Repairs shall include the complete restoration of all damage to planting, paving or other improvements of any kind as a result of the work.

1.11 GUARANTEE

- A. The entire sprinkler system, including all work done under this contract, shall be unconditionally guaranteed against all defects and fault of material and workmanship, including settling of backfilled areas below grade, for a period of one (1) year following the filing of the Notice of Completion.
- B. Should any problem with the irrigation system be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to Owner within ten (10) calendar days of receipt of written notice from Owner. When the nature of the repairs as determined by the Owner constitute an emergency (i.e. broken pressure line) the Owner may proceed to make repairs at the Contractor's expense. Any and all damages to existing improvement resulting either from faulty materials or workmanship, or from the necessary repairs to correct same, shall be repaired to the satisfaction of the Owner by the Contractor, all at no additional cost to the Owner.
- C. Guarantee shall be submitted on Contractors own letterhead as follows:

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse, or neglect excepted. We agree to repair or replace any defective material during the period of one year from date of filing of the Notice of Completion and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within 10 calendar days following written notification by the Owner. In the event of our failure to make such repairs or replacements within the time specified after receipt of written notice from Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT NAME:

PROJECT LOCATION:

CONTRACTOR NAME:

ADDRESS:

TELEPHONE:

SIGNED:

DATE:

PART 2 - MATERIALS

2.1 SUMMARY

Use only new materials of the manufacturer, size and type shown on the drawings and specifications. Materials or equipment installed or furnished that do not meet Landscape Architect's, Owner's, or governing agencies standards will be rejected and shall be removed from the site at no expense to the Owner.

2.2 PIPE

- A. Pressure supply line between the water meter and the backflow prevention device shall be type K copper, one size larger than backflow device.
- B. Backflow prevention assemblies, and all other above grade assemblies, shall be constructed of threaded brass pipe and threaded brass fittings the same size as the backflow device, unless otherwise directed.
- C. Pressure supply lines 2 inches in diameter and up to 3 inches in diameter downstream of backflow prevention unit shall be Class 315 solvent weld PVC. Piping shall conform to ASTM D2241.
- D. Non-pressure lines 3/4 inch in diameter and larger downstream of the remote control valve shall be SCH 40 solvent weld PVC conforming to ASTM D1785.

2.3 METAL PIPE AND FITTINGS

- A. Brass pipe shall be 85 percent red brass, ANSI, IPS Standard 125 pounds, Schedule 40 screwed pipe.
- B. Fittings shall be medium brass, screwed 125-pound class.
- C. Copper pipe and fittings shall be Type "K" sweat soldered, or brazed as indicated on the drawings.

2.4 PLASTIC PIPE AND FITTINGS

- A. Pipe shall be marked continuously with manufacturer's name, nominal pipe size, schedule or class, PVC type and grade, National Sanitation Foundation approval, Commercial Standards designation, and date of extrusion.
- B. All plastic pipe shall be extruded of an improved PVC virgin pipe compound in accordance with ASTM D2672, ASTM D2241 or ASTM D1785.
- C. All solvent weld PVC fittings shall be standard weight Schedule 40 (and Schedule 80 where specified on the irrigation detail sheet, all mainline fittings shall be Schedule 80 PVC) and shall be injection molded of an improved virgin PVC fitting compound. Slip PVC fittings shall be the "deep socket" bracketed type. Threaded plastic fittings shall be injection molded. All tees and ells shall be side gated. All fittings shall conform to ASTM D2464 and ASTM D2466.
- D. All threaded nipples shall be standard weight Schedule 80 with molded threads and shall conform to ASTM D1785.
- E. All solvent cementing of plastic pipe and fittings shall be a two-step process, using primer and solvent cement applied per the manufacturer's recommendations. Cement shall be of a fluid consistency, not gel-like or ropy. Solvent cementing shall be in conformance with ASTM D2564 and ASTM D2855.
- F. When connection is plastic to metal, female adapters shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be non-lead base Teflon paste, tape, or equal.

- G. All pressure mainlines installed with solvent weld PVC fittings shall be installed with concrete thrust blocking at all directional changes in the mainline routing. Concrete thrust blocking shall not be required when ductile iron fittings and mechanical restraints are specified.

2.5 BACKFLOW PREVENTION UNITS

- A. The backflow prevention unit shall be of the manufacturer, size, and type indicated on the drawings.
- B. The backflow prevention unit shall be installed in accordance with the requirements set forth by local codes.
- C. The backflow enclosure shall be of the manufacturer, size, and type indicated on the drawings.
- D. The backflow freeze prevention cover shall be of the manufacturer, size, and type indicated on the drawings.

2.6 VALVES

- A. Ball Valves:
 - 1. Ball valves shall be of the manufacturer, size, and type indicated on the drawings.
 - 2. Ball valves shall be constructed of a bronze or stainless steel body, stainless steel ball and stem. Ball valves shall have threaded connections.
 - 3. All ball valves shall have a minimum working pressure of not less than 150 PSI and shall conform to AWWA standards.
- B. Quick Coupler Valves:
 - 1. Quick coupler valves shall be of the manufacturer, size, and type indicated on the drawings.
 - 2. Quick coupler valves shall be brass with a wall thickness guaranteed to withstand normal working pressure of 150 psi without leakage. Valves shall have 1" female threads opening at base, with two-piece body. Valves to be operated only with a coupler key, designed for that purpose. Coupler key is inserted into valve and a positive, watertight connection shall be made between the coupler key and valve.
- C. Automatic Control Valves:
 - 1. Automatic control valves shall be of the manufacturer, size, and type indicated on the drawings.
 - 2. Automatic control valves shall be electrically operated.
 - 3. Provide Christy's valve ID tags for each remote control valve with valve number.

2.7 VALVE BOXES

- A. Valve boxes shall be fabricated from a durable, weather-resistant plastic material resistant to sunlight and chemical action of soils.
- B. The valve box cover shall be green in color and secured with a hidden latch mechanism or bolts.
- C. The cover and box shall be capable of sustaining a load of 1,500 pounds.
- D. Valve box extensions shall be by the same manufacturer as the valve box.

- E. The plastic irrigation valve box cover shall be an overlapping type.
- F. Automatic control valve, master valve, flow sensor, and ball valve boxes shall be 17"x11"x12" 'nominal' rectangular size. Valve box covers shall be marked "RCV" with the valve identification number, or "MV", "FS", "BV" "heat branded" onto the cover in 1-1/4 inch high letters / numbers.
- G. Drip flush valve and Air relief valve boxes shall be 7" circular size. Valve box covers shall be marked with "FV" or "ARV" "heat branded" onto the cover in 1-1/4 inch high letters.
- H. Quick coupler valve boxes shall be 10" circular size. Valve box covers shall be marked with "QCV" "heat branded" onto the cover in 1-1/4 inch high letters.

2.8 AUTOMATIC CONTROLLER

- A. Automatic controller shall be of the manufacturer, size, and type indicated on the drawings.
- B. Controller enclosure shall be of the manufacturer, size, and type indicated on the drawings.
- C. Controller shall be grounded according to local codes using equipment of the manufacturer, size, and type indicated on the drawings; or as required by local codes and ordinances.

2.9 ELECTRICAL

- A. All electrical equipment shall be NEMA Type 3, waterproofed for exterior installations.
- B. All electrical work shall conform to local codes and ordinances.

2.10 LOW VOLTAGE CONTROL WIRING

- A. Remote control wire shall be direct-burial AWG-UF type, size as indicated on the drawings, and in no case smaller than 12 gauge.
- B. Remote control wire shall be 12 AWG solid core twisted pair, type as indicated on the irrigation drawings.
- C. Connections shall of the manufacturer, size, and type indicated on the drawings.
- D. Common wires shall be white in color. Control wires shall be red (where two or more controllers are used, the control wires shall be a different color for each controller. These colors shall be noted on the "Record Drawings" plans located on controller door).
- E. Ground wires shall be green in color or bare copper and in no case smaller than 6 gauge.

2.11 IRRIGATION HEADS AND INLINE DRIP TUBING

- A. Irrigation heads, and inline drip tubing shall be of the manufacturer, size, type, with radius of throw, operating pressure, and discharge rate indicated on the drawings.
- B. Irrigation heads, and inline drip tubing shall be used as indicated on the drawings.

2.12 DRIP IRRIGATION EQUIPMENT

Drip tubing equipment such as flush valves, air relief valves, wye strainers and pressure regulators shall be of the manufacturer, size, and type indicated on the drawings.

2.13 MISCELLANEOUS EQUIPMENT

- A. Landscape Fabric:
 - 1. Landscape fabric for valve box assemblies shall be 5.0- oz. weight woven polypropylene weed barrier. Landscape fabric shall have a burst strength of 225 PSI, a puncture strength of 60 lbs. and capable of water flow of 12 gallons per minute per square foot.
 - 2. Type: DeWitt Pro 5 Weed Barrier or approved equal.
- B. Equipment such as flow sensors, rain sensors, freeze sensors, flush valves, air relief valves, wye strainers, and master valves shall be of the manufacturer, size and type indicated on the drawings.
- C. Booster Pump Assembly
 - 1. A simplex water pressure booster system as designed and fabricated by Barrett Engineered Pumps (619) 232-7867. The system shall be a completely prefabricated system with pump, piping, electrical and structural elements. The entire booster pump assembly shall be UL Listed and Approved.
 - 2. Pump shall be:
 - a. GA Series: single stage end suction close coupled centrifugal, cast-iron bronze fitted construction, equipped with mechanical shaft seal, back pullout design. The impeller shall be threaded directly to the end of the shaft. Pump shaft shall be stainless steel with no sleeve. The pump shall be directly coupled to a C-face electric motor.
 - 3. The electric motor shall be of the squirrel cage induction type suitable for full voltage starting. Motor shall be ODP to aid in cooling. Electric motor shall be rated for continuous service. The motor shall have horsepower ratings such that the motor will carry the maximum possible load to be developed under the designed pumping conditions and not overload the motor beyond the nameplate rating of the motor. Motor shall have a 1.15 service factor. The motor shall conform to the latest NEMA Standards for motor design and construction.
 - 4. The pump Control Panel shall have a UL Listed Modular NEMA4X plain front non-metallic enclosure with stainless steel lockable latches. This Includes power and control re-settable thermal circuit breakers or Time Delay Fuses, heavy duty magnetic starter with adjustable overload protection, Controls Relays, Control on/off Switch, Hand-Off-Auto switch to select mode of operation, heavy duty numbered terminal strips for power and control wiring lead terminations to land all field wiring, Ground Lugs, Motor wiring whip, VFD to remote panel wiring whip, and wiring schematic.
 - 5. 24V control started; a Metal oxide varistor protected pump start relay shall be incorporated in panel to start pump with signal from an irrigation controller.
 - 6. All system piping shall be Schedule 10S 304 stainless steel. All major fittings shall be 304 stainless steel with flanges to allow for system disassembly or major component removal. All instrumentation fittings shall be 304SS.
 - 7. Isolation valves shall be all stainless quarter turn ball valves with hard chrome ball on lines 2" and less. Isolation valves shall be lug style butterfly valves with Buna-N elastomeric seats, ductile iron nickel coated disc, and stainless-steel stem with handle and 10 position galvanized memory plate on lines 2½" and greater.
 - 8. Gauges shall be 2½" diameter face, glycerin filled with stainless casing and brass internals.
 - 9. The Flow switch shall be a 316 stainless steel and solid-state thermal sensor designed to measure change in flow velocity and in temperature. The flow switch shall include an

- integrated bar graph with 10 LED lights and shall be capable of providing an indication of flow (green), closed (orange), and open (red) conditions.
10. The pump system shall be mounted on a structural aluminum skid with mounting flanges on front and back to allow for mounting of skid to concrete pad. Skid equipped with pipe support on suction and discharge piping. All nuts and bolts and washers shall be stainless steel on skid and piping. Skid shall include mounting hardware for integral aluminum enclosure.
 11. The system enclosure shall be vandal and weather resistant, marine grade aluminum alloy 5052-H32 construction with rectangular punch-outs for viewing and heat dissipation. The enclosure shall be low profile hinged top design with padlock provision. The cover shall be secured to the concrete pad with stainless steel hardware. The enclosure shall measure 30D" x 42W" x 30H" and concrete pad dimensions shall be 42" x 54". The enclosure shall be manufactured by V.I.T. Products, Inc.
 12. Pump Assembly shall include the following option(s):
 - a. (PACT) Where specified by the System Design Parameters, the following items shall be provided to allow for stand-alone system pressure activation of pumping unit:
 - 1) Variable Frequency Drive system to receive feedback signal from system mounted stainless steel pressure transducer, and in conjunction with internal software driven PID control loop to maintain customer adjustable constant system discharge pressure by varying the speed of the pump in response to varying system load. Variable Frequency Drive shall provide for on/off control of pumping unit via system pressure monitoring.
 - 2) Bladder Style Pressure Storage Tank, piped to pump discharge, designed to maintain system pressure when pump is off and properly sized by the manufacturer to prevent short cycling of pumping system.
 - 3) Spring loaded wafer style disc check valve with cast iron body, bronze disc, and stainless-steel spring to maintain system pressure when pump is off.
 13. The services of a factory representative or trained service professional shall be made available on the job site to check installation and perform the startup and instruct the operating personnel. A startup report containing voltage and amperage readings, suction and discharge pressure readings, estimated flow conditions, and general operating characteristics shall be submitted to the Owner.
 14. One electronic set of operating and maintenance manual shall be provided to the owner after startup and shall include parts manuals for major components, performance curve for pump, general sequence of operation, and electrical schematic for control panel.
 15. The warranty period shall be a non-prorated period of 36 months from date of purchase.

IBGA5-2-2-2/PACT System Model Number		56 GPM System Design Flow Rate	80 PSI System Design Pressure	2 INCH System Piping Size
60 PSI Minimum Suction Pressure		208-230 or 460 VAC System Electrical Voltage		1 or 3 PHASE 60 Hz System Electrical Phase and Frequency
20GA5-1 1/4" Pump Model Number		56 GPM Pump Capacity (GPM)		85 FEET Pump Total Head (Feet)
2 HP Pump Horsepower	3500 RPM Pump RPM	Undetermined Voltage System Full Load Amperage		

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Inspections:

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 2. Verify that irrigation system may be installed in strict accordance with all pertinent codes and regulations, the original design, the referenced standards, and the manufacturer's recommendations.
- B. Discrepancies:
1. In the event of discrepancy, immediately notify the Landscape Architect or Owner's authorized representative.
 2. Do not proceed with installation in areas of discrepancy until all discrepancies have been resolved.
- C. Grades:
1. Before starting work, carefully check all grades to determine that work may safely proceed, keeping within the specified material depths with respect to finish grade.
 2. Final grades shall be accepted by the Engineer before work on this section will be allowed to begin.
- D. Field Measurements:
1. Make all necessary measurements in the field to ensure precise fit of items in accordance with the original design. Contractor shall coordinate the installation of all irrigation materials with all other work.
 2. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions prior to proceeding with work under this section.
 3. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities, which are caused by his operations or neglect.
- E. Diagrammatic Intent:
- The drawings are essentially diagrammatic. The size and location of equipment and fixtures are drawn to scale where possible. Provide offsets in piping and changes in equipment locations as necessary to conform with structures and to avoid obstructions or conflicts with other work at no additional expense to Owner.
- F. Layout:
1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads, valves, backflow preventer, and automatic controller.
 2. Layout irrigation system and make minor adjustments required due to differences between site and drawings. Where piping is shown on drawings under paved areas, but running parallel and adjacent to planted areas, install the piping in the planted areas.
- G. Water Supply:
- Connections to, or the installation of, the water supply shall be at the locations shown on the drawings. Minor changes caused by actual site conditions shall be made at no additional expense to Owner.
- H. Electrical Service:
1. Connections to the electrical supply shall be at the locations shown on the drawings. Minor changes caused by actual site conditions shall be made at no additional expense to Owner.
 2. Contractor shall make electrical connections to the irrigation controller. Electrical power source to controller locations shall be provided by others.
 3. Contractor shall make electrical connections to the irrigation controller. 230-volt single-phase electrical power source to pump assembly location shall be provided by others per NEC codes.

3.2 TRENCHING

- A. Excavations shall be straight with vertical sides, even grade, and support pipe continuously on bottom of trench. Trenching excavation shall follow layout indicated on drawings to the depths below finished grade and as noted. Where lines occur under paved area, these dimensions shall be considered below subgrade.
- B. Provide minimum cover of 18 inches on pressure supply lines 2 ½ inches and smaller.
- C. Provide minimum cover of 24 inches on pressure supply lines 3 inches and larger.
- D. Provide minimum cover of 18 inches for control wires within planters.
- E. Provide minimum cover of 24 inches for control wires within sleeves below paving.
- F. Provide minimum cover of 36 inches on pressure supply lines under vehicular travel ways.
- G. Provide minimum cover of 12 inches for non-pressure lines.
- H. Pipes installed in a common trench shall have a 4-inch minimum space between pipes.

3.3 THRUST BLOCKS

- A. Thrust blocks must be constructed of Class "B" concrete.
- B. Thrust blocks shall be poured against undisturbed site soil.
- C. PVC fitting joints shall be kept free of concrete. Do not encase fitting in concrete.
- D. Thrust blocking shall be sized to provide the minimum bearing areas as shown below. Bearing areas indicated have been calculated for Class 200 PVC pipe at a test pressure of 150 PSI in soil with 2,000 PSI bearing capacity. Increase thrust block sizing as necessary for varying soil conditions.
 - 1. Provide a minimum thrust block bearing area of 2.0 square feet on all bends (all degrees) and tees installed on pressure supply lines 4 inches and smaller.
 - 2. Provide a minimum thrust block bearing area of 4.0 square feet on all 90 degree bends installed on pressure supply lines 6 inches in size. Bends of less than 90 degrees shall require a thrust block with a bearing area of 2.0 square feet for 6 inch mainline.
 - 3. Provide a minimum thrust block bearing area of 3.0 square feet on all tees installed on pressure supply lines 6 inches in size.
 - 4. Provide a minimum thrust block bearing area of 6.5 square feet on all 90 degree bends installed on pressure supply lines 8 inches in size. Bends of less than 90 degrees shall require a thrust block with a bearing area of 3.5 square feet for 8 inch mainline.
 - 5. Provide a minimum thrust block bearing area of 4.5 square feet on all tees installed on pressure supply lines 8 inches in size.

3.4 BACKFILLING

- A. Backfill material on all lines shall be the same as adjacent soil free of debris, litter, and rocks over 1/2 inches in diameter.
- B. Backfill shall be tamped in 4-inch layers under the pipe and uniformly on both sides for the full width of the trench and the full length of the pipe. Backfill materials shall be sufficiently damp

to permit thorough compaction, free of voids. Backfill shall be compacted to dry density equal to adjacent undisturbed soil and shall conform to adjacent grades.

- C. Flooding in lieu of tamping is not allowed.
- D. Under no circumstances shall truck wheels be used to compact backfill.
- E. Provide sand backfill a minimum of 4 inches over and under all piping under paved areas.

3.5 PIPING

- A. Piping under existing pavement may be installed by jacking, boring, or hydraulic driving. No hydraulic driving is permitted under asphalt pavement.
- B. Cutting or breaking of existing pavement is not permitted.
- C. Carefully inspect all pipe and fittings before installation, removing dirt, scale, burrs, and reaming. Install pipe with all markings up for visual inspection and verification.
- D. Remove all dented and damaged pipe sections.
- E. All lines shall have a minimum clearance of 4 inches from each other and 12 inches from lines of other trades.
- F. Parallel lines shall not be installed directly over each other.
- G. In solvent welding, use only the specified primer and solvent cement and make all joints in strict accordance with the manufacturer's recommended methods including wiping all excess solvent from each weld. Allow solvent welds at least 15 minutes setup time before moving or handling and 24 hours curing time before filling.
- H. PVC pipe shall be installed in a manner, which will provide for expansion and contraction as recommended by the pipe manufacturer.
- I. Center load all plastic pipe prior to pressure testing.
- J. All threaded plastic-to-plastic connections shall be assembled using Teflon tape or Teflon paste.
- K. For plastic-to-metal connections, work the metal connections first. Use a non-hardening pipe dope on all threaded plastic-to-metal connections, except where noted otherwise. All plastic-to-metal connections shall be made with plastic female adapters.

3.6 CONTROLLER

- A. The exact location of the controller shall be approved by the Landscape Architect or Owner's authorized representative before installation. The electrical service shall be coordinated with this location.
- B. The Irrigation Contractor shall be responsible for the final electrical hook up to the irrigation controller.
- C. The irrigation system shall be programmed to operate during the periods of minimal use of the design area.

3.7 CONTROL WIRING

- A. Low voltage control wiring shall occupy the same trench and shall be installed along the same route as the pressure supply lines whenever possible.
- B. Where more than one wire is placed in a trench, the wiring shall be taped together in a bundle at intervals of 10 feet. Bundle shall be secured to the mainline with tape at intervals of 20 feet.
- C. All connections shall be of an approved type and shall occur in a valve box. Provide an 18-inch service loop at each connection.
- D. An expansion loop of 12 inches shall be provided at each wire connection and/or directional change, and one of 24 inches shall be provided at each remote control valve.
- E. A continuous run of wire shall be used between a controller and each remote control valve. Under no circumstances shall splices be used without prior approval.

3.8 VALVES

- A. Automatic control valves, quick coupler, and ball valves are to be installed in the approximate locations indicated on the drawings.
- B. Valve shall be installed in shrub areas whenever possible.
- C. Install all valves as indicated in the detail drawings.
- D. Valves to be installed in valve boxes shall be installed one valve per box.
- E. Provide valve ID tags for each remote control valve with valve number.

3.9 VALVE BOXES

- A. Valve boxes shall be installed in shrub areas whenever possible.
- B. Each valve box shall be installed on a foundation of 3/4 inch gravel backfill, 3 cubic feet minimum. Valve boxes shall be installed with their tops 1/2 inch above the surface of surrounding finish grade in lawn areas and 2 inches above finish grade in ground cover areas.

3.10 IRRIGATION HEADS AND INLINE DRIP TUBING

- A. Irrigation heads and inline drip tubing shall be installed as indicated on the drawings.
- B. Spacing of heads and inline drip tubing shall not exceed maximum indicated on the drawings.
- C. Riser nipples shall be of the same size as the riser opening in the sprinkler body.

3.11 BACKFLOW PREVENTION UNITS

- A. Backflow Prevention Units shall be installed as indicated on the drawings. The backflow prevention unit shall be installed in accordance with the requirements set forth by local codes.
- B. The exact location of the backflow device shall be approved by the Landscape Architect or owner's authorized representative before installation.

- C. The contractor shall be responsible for the testing and certification of the backflow device for proper operation. Testing and certification shall be performed by a state qualified backflow tester.

3.12 MISCELLANEOUS EQUIPMENT

- A. Install all assemblies specified herein according to the respective detail drawings or specifications, using best standard practices.
- B. Quick coupler valves shall be set approximately 18 inches from walks, curbs, header boards, or paved areas where applicable.
- C. Install devices such as rain sensors, flush valves, and air relief valves, master valves and flow sensors as indicated on the drawings and as recommended by the manufacturer.

3.13 FLUSHING THE SYSTEM

- A. Prior to installation of irrigation heads, the valves shall be opened and a full head of water used to flush out the lines and risers.
- B. Irrigation heads shall be installed after flushing the system has been completed.

3.14 ADJUSTING THE SYSTEM

- A. Contractor shall adjust valves, align heads, and check the coverage of each system prior to coverage test.
- B. If it is determined by the Landscape Architect or Owner's authorized representative that additional adjustments or nozzle changes will be required to provide proper coverage, all necessary changes or adjustments shall be made prior to any planting.
- C. The entire system shall be operating properly before any planting operations commence.
- D. Automatic control valves are to be adjusted so that the irrigation heads, and inline drip tubing operate at the pressure recommended by the manufacturer.

3.15 TESTING AND OBSERVATION

- A. Do not allow or cause any of the work of this section to be covered up or enclosed until it has been observed, tested and accepted by the Landscape Architect, Owner, and governing agencies.
- B. The Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing.
- C. When the sprinkler system is completed, the Contractor shall perform a coverage test of each system in its entirety to determine if the water coverage for the planted areas is complete and adequate in the presence of the Landscape Architect.
- D. The Contractor shall furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the plans, or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate, without bringing

this to the attention of the Landscape Architect. This test shall be accepted by the Landscape Architect and accomplished before starting any planting.

- E. Areas to be maintained for the formal maintenance period shall start maintenance at the same time, as directed by the Landscape Architect, Owner, and governing agencies. Partial areas will not be released into maintenance prior to completion of items listed in the pre-maintenance review. The maintenance period may not be phased.
- F. If, after the maintenance review, the irrigation systems are not accepted by the Landscape Architect, the contractor shall reimburse the Architect for additional site visits, or additional time required to review work. All additional time will be billed at the Architect's hourly rate and will be paid for by the contractor at no additional cost to the owner.
- G. Final inspection will not commence without record drawings as prepared by the Irrigation Contractor.

3.16 MAINTENANCE

During the maintenance period the Contractor shall adjust and maintain the irrigation system in a fully operational condition providing complete irrigation coverage to all intended plantings.

3.17 COMPLETION CLEANING

Clean up shall be made as each portion of the work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be swept, and any damage sustained on the work of others shall be repaired to original conditions.

END OF SECTION 32 84 00

SECTION 32 91 13 - NATURAL TURF PLAYING FIELD SOIL PREPARATION

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

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. The Contractor shall provide all the necessary qualified labor, materials, equipment, and all laboratory testing costs necessary for the complete installation of the bridging gravel and rootzone material.

1.2 PROJECT CONDITIONS

- A. The Contractor shall be responsible for maintaining finish grades in all areas to receive bridging gravel bedding and rootzone material and for executing any fine grading as may be necessary or incidental to placement of the sod.
- B. Bridging gravel and rootzone material shall not be contaminated with other soil. Bridging gravel and rootzone material contaminated by other soil shall be rejected and removed by the Contractor from the site at the Contractor's expense in a legal manner.

PART 2 – PRODUCTS

2.1 BRIDGING GRAVEL BEDDING

- A. The gravel shall consist of a washed bridging gravel that meets the following criteria:
1. 100% passing a ½ inch (12.5mm) sieve
 2. No more than 10% passing a 10 mesh (2.0mm) sieve
 3. No more than 5% passing an 18 mesh (1.0mm) sieve
 4. D15 Gravel ≤ 5 x D85 sand (Bridging)
 5. D15 Gravel ≥ 5 x D15 sand (Permeability)
- B. Soft limestone and shale materials are not suitable. Questionable materials should be evaluated using a sulfate soundness test (ASTM C-88) and LA Abrasion Test (ASTM C-131) or MicroDeval Testing Method (ASTM D6928). Results shall not to exceed a loss of Material greater than 18%.

Test Method	Criteria
Sulfate Soundness (C-88)	Not to exceed 12% Loss
LA Abrasion (ASTM C-131)	Not to exceed 40

2.2 ROOTZONE MATERIAL

- A. The rootzone material shall consist of 10" in depth of 100% U.S.G.A. sand.
- B. Sand with a pH level of 8.2 or higher is not acceptable. Sand that has a pH range of 7.9 to 5.2 is acceptable. Any sand that has a pH level between 8.0 and 8.2 shall have gypsum (Ca So₄) added at the rate of 10 lbs. per 1,000 square feet and shall subsequently be leached to bring pH to a level between 7.9 and 5.2.
- C. Particle size for the USGA specification sand shall be as follows:

Name	Particle Diameter	Recommendation (by weight)
Fine Gravel	2.0 -3.4 mm	Not more than 10% of the total particles in this range, including a maximum of 3% fine gravel
Very Coarse Sand	1.0 -2.0 mm	(Preferably none)
Coarse Sand Medium sand	0.5 – 1.0 mm 0.25-0.50 mm	Minimum of 60% of particles must fall in this range
Fine sand	0.15 – 0.25 mm	Not more than 20% of the particles may fall within this range
Very Fine Sand	0.05 – 0.15 mm	Not more than 5%
Silt	0.002 – 0.05 mm	Not more than 5%
Clay	less than 0.002 mm	Not more than 3%
Total Fines	Very fine sand + Silt + Clay	Less than or equal to 10%

- A. The rootzone mix shall be analyzed using a 20.32 cm profile for the 8" deep rootzone. The prepared lab cores shall meet the following performance criteria:

Physical Property	Range
Total Porosity	35% - 55%
Air-filled Porosity	15% - 30%
Capillary Porosity	15% - 25%
Infiltration rate	12 to 18 inches per hour
Bulk Density	1.2 to 1.6 grams/cm3
Total Pore Space	35% to 55%
Degree of Saturation	30% to 60%
Organic Matter (dry weight)	0.0% to 0.2%

G. DRAINAGE GRAVEL MATERIAL:

1. The drainage gravel material shall conform to ASTM standard specifications subject to the Landscape Architect approval based on the testing labs certification and meet the following requirements using ASTM Method C136:

Drainage Gravel Material 57 Stone or Equal	
Sieve Size	% Passing by Weight
1-1/2"	100
1"	95-100
3/4"	
1/2"	25-80
3/8"	
No. 4	0-10
No. 8	0-5
No. 16	0
No. 50	0

2. Drainage gravel and bridging stone shall be laboratory tested in accordance with the most current ASTM testing method. The drainage gravel infiltration rate shall be no less than 300 inches per hour. The bridging gravel infiltration rate shall be no less than 150 inches per hour.
3. The Contractor is fully financially responsible for all laboratory testing.

PART 3 - EXECUTION

3.1 QUALITY CONTROL TESTING

A. Recommended Testing Laboratory:

Wallace Laboratories
 365 Coral Circle
 El Segundo, CA 90245
 (T) 1-310-615-0116
 (E) info@wllabs.com
 www.wllabs.com
 Or approved equivalent laboratory

B. Testing shall conform to the following ASTM methods:

1. Particle Size Analysis (USGA SAND): ASTM F1632 Method B & Determination of Size Factors
2. pH: ASTM D4972 w/H₂O
3. Infiltration Rate: ASTM F1815
4. Particle Density: SSSA, Methods of Soil Analysis
5. Gravel Distribution Analysis: ASTM Method C136 & Determination of Size Factors SOP
6. All sampling shall be done in accordance with U.S.G.A. guidelines.
7. ASTM F 2396-04 Coefficient of Uniformity (CU) value of 2.5-4.5

C. The Contractor is responsible for all initial material samples collections, shipping and all costs associated with the submission to the approved testing laboratory (as denoted below) for baseline testing. The Contractor shall authorize the laboratory to copy all test results to the

Engineer of Record for initial review. The Contractor shall formally submit all results to the Playing Field Contractor for proper distribution within fifteen (15) calendar days after issuance of the Notice to Proceed. Each individual material shall come from one supplier. Baseline results must be formally approved by the Landscape Architect of Record prior to commencement with installation of all materials required to be tested.

- D. The Contractor shall include the following items with the initial materials submittal:
1. Identification of proposed source.
 2. Current lab mechanical analysis of the proposed sand.
 3. Current lab mechanical analysis of the proposed bridging gravel.
 4. Sample sizes shall be provided in one-gallon double sealed bags.
 5. Submit a letter of certification to the Engineer of Record that the supplier can deliver the total quality of material needed to complete the entire project in a timely manner.
- E. The Contractor at his/her expense shall perform a full USGA and ASTM F-2396-04 Coefficient of Uniformity analysis of the initial submittal is approved. Approval of the initial submittal does not guarantee the materials will be approved for this project. Formal approval is contingent on the results of the full USGA and ASTM analysis.
- F. During Construction the Materials shall be Sampled as follows:
1. The rootzone material shall be stored in 500-ton stockpiles, the material shall be tested prior to being delivered to the job site. The stockpile size and testing may be increased to 1000 tons with the Landscape Architect of Records approval, and only if the results are consistent between stockpiles. The increase in tons size testing is at the sole discretion of the Landscape Architect of Record.
 2. The gravel shall be stored in 1000-ton stockpiles; the material shall be tested and approved by the Landscape Architect of Record prior to delivery to the job site.
 3. No on-site storage of rootzone or gravel material is permitted, except for required attic stock.
- G. ROOTZONE MATERIAL:
1. The sand shall be in 500-ton piles and shall be tested by the owner's approved testing laboratory and released to the Landscape Architect of Record. The initial 500 tons will have a full USGA evaluation performed by the Owner's approved testing laboratory and the performance shall be consistent to the approved rootzone material as indicated above.
 2. The initial rootzone material approved by the Landscape Architect of Record shall then be the baseline for which all future rootzone material will be compared to for consistency of particle size distribution.
 3. Each 500-ton pile of rootzone material shall be tested by the owner's approved testing agent and released by the Landscape Architect of Record only after all piles are confirmed to be uniform and consistent with the baseline test results.

3.2 PLACEMENT OF BRIDGING GRAVEL AND ROOT ZONE MATERIAL

A. PROTECTION MEASURES

1. All approved rootzone material shall be protected from contamination during storage and transport prior to placement at the job site.
2. In performing this work, the Contractor shall avoid damage to any existing structures or features of the playing field and or features under construction, such as drainage and irrigation systems. Any such damage shall be repaired by the Contractor at his/her own expense.
3. Each 500-ton pile of rootzone material shall be tested by the Owner's approved testing laboratory and released only after all piles are confirmed to be uniform and consistent with the approved baseline samples submitted to the lab.

B. PLACEMENT OF BRIDGING GRAVEL BEDDING

1. In performing this work, the Contractor shall avoid damage to any existing structures or features of the playing fields or features under construction, such as drainage and irrigation systems. Any such damage shall be repaired by the Contractor at his/her own expense.
2. As part of this work, the Contractor shall check all graded areas and ensure that all features of the subgrade are at the proper finished grade, with no changes or damage to grades, as specified herein and on the grading plan.
3. The bridging gravel area subgrade shall be graded to form a smooth clean basin free of any debris and/or loose soil. The bridging gravel shall not be installed until all finished grading, irrigation, electrical, and drainage are completed, in order to avoid the mixing of other soil and materials with the bridging gravel bedding material.
4. Bridging gravel trucked into the site must be done in such a manner as not to alter the subgrade and/or damage drainage, electrical, and irrigation systems.

C. PLACEMENT OF THE ROOTZONE MATERIAL

1. In performing this work, the Contractor shall avoid damage to any existing structures or features of the playing fields or features under construction, such as drainage and irrigation systems. Any such damage shall be repaired by the Contractor at his own expense.
2. As part of this work, the Contractor shall check all graded areas and assure that all features of the bridging gravel bedding are at the proper finished grade, with no changes or damage to grades, as specified herein and on the grading plan.
3. The rootzone shall not be installed until all finished grading, irrigation, drainage, and bridging gravel placement are completed, in order to avoid the mixing of other soil and materials with the rootzone.
4. Rootzone trucked into the site must be done in such a manner as not to alter the bridging gravel bedding and/or damage drainage, electrical, and irrigation systems.

5. Prior to seeding, the rootzone mix shall be thoroughly settled and leveled by either rolling or packing by treads of a small bulldozer, watering (*preferred method*), and floating with a drag. The firmed rootzone mix shall then be heavily irrigated to determine any irregularities or ponding. All depressions or high spots shall be leveled to final grade. Upon completion of compaction and leveling operations, a uniform depth of rootzone mix, as measured compacted and in-place, must be present over the entire playing field prior to seeding.
6. Finished grade tolerances for the rootzone shall be in accordance with project grading plan or plus or minus tolerance 0.04% on a 25' grid.

END OF SECTION

SECTION 32 92 00 - LAWNS AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Hydromulch Seeding and Soil Supplements
 - 2. Dry Application Seeding.
 - 3. Solid Sod Installation
- B. Related Sections
 - 1. Finish Grading - Section 31 2215
 - 2. Planting - Section 32 9300
 - 3. Landscape Maintenance - Section 32 9400

1.2 QUALITY ASSURANCE

- A. Source:
 - 1. Seed: The Owner's representative shall be furnished a signed copy of statement from vendor, certifying that each container of seed delivered is labeled in accordance with the Federal Seed Act and is at least equal to requirements previously specified. Seed analysis shall be furnished prior to commencement of planting operations. Each lot of seed may be resampled and retested in accordance with latest Rules and Regulations under the Federal Seed Act at the discretion of the Owner's representative. If these tests reveal the seed to be below the specified pure live seed content, the Contractor shall be required to plant additional seed to compensate for the deficiency at no additional cost to the Owner. The State Seed Laboratory will conduct the seed retests. Allowance will be made for the actual pure live seed content of the specified grasses in determining the actual planting rate.
- B. Inspections:
 - 1. Make written request for inspection after seeding operations have been completed. Such inspection is for the purpose of establishing the Maintenance Period.
 - 2. Submit written requests for inspections to the Owner's representative at least 7 days prior to anticipated inspection date.

1.3 SUBMITTALS

- A. Furnish required copies of manufacturers literature, certifications, or laboratory analytical data for the following items:
 - 1. Seed source. (Certification)
 - 2. Fiber mulch. (Laboratory analytical data)
 - 3. Tank mix fertilizer. (Certification or laboratory analytical data)
 - 4. Topdress fertilizer. (Certification)

1.4 MAINTENANCE BY THE CONTRACTOR (refer to section 32 9400)

1.5 FINAL ACCEPTANCE

- A. Work under this Section will be accepted by Owner's representative upon satisfactory completion of all work, but exclusive of re-application under the Guarantee Period. Final Acceptance of lawn or prairie establishment shall be as follows:

1. For Sod: Complete lush cover with no brown sections or cracks showing. Sod shall have established to the extent that satisfactory capillary action between the sod and soil has been established.
2. For Lawn Seed: 95% uniform coverage of grass in excess of 1" height. No bare spots of greater than 2 square feet will be accepted.
3. For Native Seed: 90% coverage of plants in excess of 6" height. No bare spots greater than 2 square feet will be accepted.
4. The Owner's representative and/or Owner shall interpret the above. Upon Final Acceptance, the Owner will assume the responsibility for maintenance of the work.
5. If the seeding season for Native Grass Mix is missed due to the wrong season for proper germination and grow-in, the contractor is required to return to the project site and apply seed the following appropriate season at no additional cost to the owner. **Native seed shall be installed March-June.**

PART 2 - PRODUCTS

2.1 SEED

- A. All seed used shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act. All seed shall be furnished in sealed standard containers unless exception is granted in writing by the Owner's representative. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable.
- B. The minimum percentage by weight of pure live seed in each lot of seed shall be as follows and seed shall be planted at the rate per acre indicated under pure live seed required per acre.

Kind of Seed	Minimum % Pure Live Seed Required	Pounds Pure Live Seed Required Per Acre
PRO SPORTSFIELD ELITE FROM STOVER SEED COMPANY OR EQUAL	95	20

Note: % Pure Live Seed = % Purity X % Germination

- C. Weed seed shall not exceed 10% by weight of the total of pure live seed and other material in the mixture. Johnson grass, nut grass, or other noxious weed seed will not be allowed.
- D. If Native American Seed Mixes seeding seasons are missed the contractor will be required to seed Perennial Rye at a rate of 15 pounds per acre and return the following season to install the specified grass at no cost to the owner.

2.2 FERTILIZER FOR TANK MIX

- A. MicroLife Multi-Purpose 6-2-4, pelleted, uniform in composition, free-flowing, and suitable for application with approved equipment. The fertilizer shall be delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable state fertilizer laws, and bearing the name or trademark and warranty of the producer.

2.3 WOOD CELLULOSE FIBER MULCH

- A. Wood Cellulose fiber mulch, for use with the hydraulic application of grass seed and fertilizer, shall consist of specially prepared wood cellulose fiber. It shall be processed in such a manner that it will not contain germination or growth inhibiting factors. It shall be dyed an appropriate

color to allow visual metering of its application. The wood cellulose fibers shall have the property of becoming evenly dispersed and suspended when agitated in water. When sprayed uniformly on the surface of the soil, the fibers shall form a blotter-like groundcover which readily absorbs water and allows infiltration to the underlying soil. Weight specifications from suppliers for all applications shall refer only to air dry weight of the fiber, a standard equivalent to 18% moisture. The mulch material shall be supplied in packages having a gross weight not in excess of 100 pounds and be marked by the manufacturer to show the dry weight content. Suppliers shall be prepared to certify that laboratory and field testing of their product has been accomplished and that it meets all of the foregoing requirements.

2.4 WATER

- A. Drinkable, directly from local utility supply.

2.5 SLURRY MIX COMPONENTS PER ACRE

- A. Wood Cellulose Fiber Mulch 2,000 pounds
- B. Grass Seed (as specified)
- C. Fertilizer (13-13-13) 800 pounds

2.6 SOD (AT PERIMETER OF AREA)

- A. One year old sod, ref. planting schedule for sod selection. Sod shall be dense with the grass having been mowed at 1" height before lifting from field. All grown on fumigated soil. Sod shall be in vigorous condition, dark green in color, free of disease and harmful insects. Do not stack for more than 24 between time of cutting and time of delivery. Owner's representative reserves the right to reject any sod deemed unacceptable for installation.

2.7 TOPDRESS FERTILIZER

- A. (Delayed Application) Complete fertilizer, 50% of the nitrogen shall be derived from natural organic sources or urea-form. Available phosphoric acid shall be from superphosphate, bone, or tankage. Potash shall be derived from muriate of potash containing 60% potash. Apply at rate to achieve 1.5 # N/1000sf.
 - 1. 16% Nitrogen
 - 2. 6% Phosphoric Acid
 - 3. 8% Potash

2.8 TOPDRESS MIX

- A. Topdressing under existing trees shall be:
 - 1. 2/3 Cubic Yard Planting Soil-Ref. 32 9100
 - 2. 1/3 Cubic Yard Sand-Ref. 32 9100

PART 3 - EXECUTION

3.1 HYDROMULCH SEEDING OF BERMUDA GRASS AND PRAIRIE SEED ON PREPARED FINISHED GRADE

- A. Bed Preparation:
 - 1. Ref. Soil Preparation 32 91 00
 - 2. Rake or Harrow 3"-4" deep

- B. Hydroseeding:
1. Immediately after the finished grade has been approved, begin hydroseeding operation to reduce excessive weed growth.
- C. Perimeter Sodding:
1. Install two courses of sod at perimeter of area to receive hydroseeding. Install in compliance with requirements of "SODDING ON PREPARED FINISHED GRADE" requirements below.
- D. Special Mulching Equipment and Procedures:
1. Hydraulic equipment used for the application of fertilizer, seed, and slurry of prepared wood fiber mulch shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry containing up to 40 pounds of fiber plus a combined total of 70 pounds of fertilizer solids for each one 100 gallons of water. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of hydraulic spray nozzles, which provide even distribution of the slurry on the slopes to be seeded. The slurry tank shall have a minimum capacity of 800 gallons and shall be mounted on a traveling unit which may be either self-propelled or drawn with a separate unit which will place the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded so as to provide uniform distribution without waste. The Owner's representative may authorize equipment with smaller tank capacity provided that the equipment has the necessary agitation system and sufficient pump capacity to spray the slurry in a uniform coat.
- E. Mixing:
1. Care shall be taken that the slurry preparation takes place on the site of the work. The slurry preparation should begin by adding water to the tank when the engine is at half throttle. When the water level has reached the height of the agitator shaft, good re-circulation shall be established and seed shall be added. Fertilizer shall then be added, followed by wood pulp mulch. The wood pulp mulch shall only be added to the mixture after the seed and when the tank is at least one-third filled with water. The engine throttle shall be opened to full speed when the tank is half filled with water. All the wood pulp mulch shall be added by the time the tank is two-thirds to three-fourths full. Spraying shall commence immediately when the tank is full. The operator shall spray the area with a uniform, visible coat by using the green color of the wood pulp as a guide.
- F. Application:
1. Obtain approval of hydromulch area preparation from the Owner's representative prior to application.
 2. Operators of hydromulching equipment shall be thoroughly experienced in this type of application. Apply specified slurry mix in a motion to form a uniform mat at specified rate.
 3. Keep hydromulch within areas designated and keep from contact with other plant material.
 4. Slurry mixture which has not been applied within 4 hours of mixing shall not be used and shall be removed from the site.
 5. After application, do not operate equipment over the covered area.
 6. Immediately after application, thoroughly wash off any plant material, planting areas, or paved areas not intended to receive slurry mix. Keep all paved and planting areas clean during maintenance operations.
 7. Refer also to the maintenance portion of this Section.
- G. Unseeded Areas: Reseed unplanted areas with the specified grasses at no additional cost to the Owner.

3.2 DRY APPLICATION SEEDING FOR NATIVE GRASS/BERMUDA GRASS MIXES

- A. Seed Bed Preparation:
 - 1. Ref. Soil Preparation 32 91 00
 - 2. Rake or Harrow 3"-4" deep
- B. Seeding:
 - 1. Plant seed with a broadcast seeder or a Culti-packer seeder. Plant grass seed no deeper than ¼ inch and the distance between rows 12 inches or less. Distribute seed evenly.
 - 2. Roll the planted seedbed with a Culti-packer immediately after seeding and prior to applying mulch cover.
 - 3. Seed may be broadcast by hand for small areas or areas inaccessible to seeding equipment, as approved by the Engineer. Areas seeded by hand shall be rolled or lightly compacted, if possible.
- C. Mulching:
 - 1. Spread straw or hay mulch on seeded areas with a slope steeper than 8H:1V immediately after application of seed.
 - 2. Apply straw or hay mulch at a rate per acre of 2000lbs., to create a uniform mat of coverage a minimum of ½ inch thick to protect the seedbed.
 - 3. Secure straw or hay mulch with hydromulch or other approved methods.
 - a. Apply a hydromulch, consisting of a homogeneous aqueous mixture of recycled paper fiber, water and tackifier or soil stabilizer, to achieve a rate of 1,000 pounds of paper fiber mulch per acre over the straw mulch. Apply guar gum tackifier at a minimum rate of 50 pounds (dry weight) per acre.
 - b. Application rate for other tackifier or soil stabilizer compounds shall be in accordance with the manufacturer's recommendations and approved by the Engineer.

3.3 SODDING ON PREPARED FINISHED GRADE (REFERENCE ONLY)

- A. Bed Preparation:
 - 1. Ref. Soil Preparation 32 91 00
 - 2. Immediately after the finished grade has been approved, begin sodding operations to reduce excessive weed growth. If sod bed is dry immediately prior to sod installation, dampen surface with a fine mist of water.
- B. Installation:
 - 1. Lay sod so that adjacent strips butt tightly with no spaces between strips. Lay sod on mounds and slopes with strips parallel to contours. Stagger joints. Sodded areas shall be flush with adjoining seeded areas. At walks and pavements lay one strip of sod parallel to pavement and make cuts at this strip. At back of curb there shall be a double sod strip totaling 36" so that it can be maintained with a 36" wide mower deck.
 - 2. Tamp and roll sod thoroughly to make contact with sod bed.
 - 3. Peg sod on slopes three to one or steeper with pegs driven through sod into soil until pegs are flush with turf. Space pegs 18" on center. Pegs shall be 1" square by 6" pine or 6" lengths of lath.
 - 4. Water sod thoroughly immediately after fertilizing.
 - 5. Roll sod with 200 lb ballast roller immediately after sod has been installed and watered.

3.4 CLEAN UP

- A. Keep all areas of work clean, neat, and orderly at all times. Keep all paved areas clean during lawn installation operations. Clean up and remove all deleterious materials and debris from the entire work area prior to Final Acceptance to the satisfaction of Owner's representative.

3.5 INSPECTIONS

- A. Make written request for inspection prior to seeding and after areas have been seeded and sodded.
- B. Submit requests for inspections to Owner's representative at least 2 days prior to anticipated inspection date.

END OF SECTION

SECTION 32 92 31 PLAYING FIELD CONTRACTOR QUALIFICATIONS

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

PART 1 – GENERAL

1.1 QUALIFICATIONS

- A. The Playing Field Contractor business must be fully licensed in the State of California for all work associated with the construction for natural turf sand-based athletic playing fields.
- B. It is preferred that the Playing Field Contractor currently holds a general contractor license issued by the State of California. The Playing Field Contractor shall be fully responsible for obtaining all the necessary local building permits and permit fees associated with the construction of the natural turf playing field system.
- C. It is preferred that the Playing Field Contractor has an individual assigned to this project that is currently a certified field builder (CFB) with the American Sport Builders Association (ASBA).
- D. The Playing Field Contractor must have successfully completed ten (10) similar Professional, NCAA, High School natural turf sand-based playing field projects in the State of California within the last five (5) years.
- E. The Playing Field Contractor must be capable of installing the Athletic Playing Field on a turnkey basis, inclusive of compacted sub-grade, sub-surface drainage, irrigation installation, rootzone installation, fine grading, seeding or turf installation, infield clay installation, and all maintenance requirements.
- F. The Playing Field Contractor and its subcontractor's must hold all the necessary active licenses in the State of California for all work associated with this project.

1.2 REQUIRED SUBMITTALS:

- A. The Playing Field Contractor: At the time of bid submission, the Playing Field Contractor and all subcontractors must provide a copy of current company, and professional business licenses issued by the State of California. Failure to provide this proof of current licenses may result in the Playing Field Contractors submission package being non-responsive.
- B. All bidders must provide a minimum of ten (10) similar Professional, NCAA, and or State of Florida high school playing field projects synthetic turf projects in the State of Florida or other additional coastal communities with the same level of rainfall intensity and duration, all similar projects must have also been completed within the last five (5) years that are similar in scope and size.
 - 1. The ten (10) similar projects submitted must include the following minimum information:
 - a) Name of the project.
 - b) Location and description of the project.
 - c) The overall original playing field budget, completion date, and if the project was constructed within the original playing field budget and schedule.
 - d) Contact name, title, phone number, Team, University, or High School responsible for overseeing the work performed.

The Playing Field Contractor is encouraged to update the contact names and phone numbers prior

to formal bid submission.

2. All bidders must provide five (5) successful similar projects in the State of Florida (Only) that are utilizing the same proposed synthetic turf system profile utilizing a turf between 2.0" – 2.5" in pile height, total pile weight, and all infill mix products. All successful projects submitted must include the following minimum information:
 - a) Name of the project.
 - b) Location and description of the project.
 - c) The overall original playing field budget, completion date, and if the project was constructed within the original playing field budget and schedule.
 - d) Contact name, title, phone number, Team, University, High School, City, or County responsible for overseeing the work performed.

All bidders are encouraged to update the contact names and phone numbers before bid submission.

- C. The Playing Field Contractor and subcontractors shall submit a written statement signed by a corporate officer; "stating that the corporation has NO present, past legal action or pending arbitration or litigation against the corporation over the past ten (10) years as a direct result of product manufacturing failure, poor workmanship, unresolved warranty issues, failure to meet owners expectations, non-payment to any sub-contractors and has been terminated based on failure to meet the project schedule.
- D. The Playing Field Contractor shall prepare an organization chart that identifies all key staff members, names, years of experience, direct roles and responsibilities, and contact cellphone numbers, and e-mail addresses. The organization chart must also list any subcontractors being utilized during any pre-or post-construction activities.
- E. The Playing Field Contractor shall submit a preliminary master bar chart for all tasks associated with the playing field construction that lists the types of work to be performed, length of time for each task, and key milestone dates.
- F. The Playing Field Contractor shall provide the name of the individual that is currently in good standing as a certified field builder (CFB) with the American Sport Builders Association (ASBA).

1.3 RELATED WORK

- A. All work listed below is related to the overall scope of playing field services:
 1. Section 32 84 00 - Planting Irrigation
 2. Section 32 91 13 - Natural Turf Playing Field Soil Preparation
 3. Section 32 92 00 – Lawns and Grasses
 4. Section 32 93 00 – Planting
 5. Section 32 94 00 – Landscape Grounds Maintenance for Ninety (90) Days

PART 2 – MATERIALS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION 32 92 31

SECTION 32 93 00 PLANTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plants.
 - 2. Tree stabilization.
 - 3. Tree-watering devices.
 - 4. Landscape edgings.
 - 5. Landscape mulches and gravels
- B. Related Requirements:
 - 1. Section 32 9200 "Lawns and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.
 - 2. Section 32 9100 "Soil Preparation"

1.2 COORDINATION

- A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
 - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
 - 2. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
 - 3. Irrigation inspection tube and cap materials.
 - 4. Fertilizer tablets for tree installation
- B. Samples for Verification: For each of the following:
 - 1. Mulch: 1-quart volume of mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
 - 2. Planting Soil Mix: 1-quart volume of mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
 - 3. Weed Control Barrier: 12 by 12 inches.
 - 4. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.

5. Tree Staking Materials and Accessories: post, hose, and webbing (sample of each)

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 2. Experience: Three years' experience in landscape installation in addition to requirements in Section 01 4000 "Quality Requirements."
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Landscape Industry Certified Technician - Exterior.
 - b. Landscape Industry Certified Interior.
 - c. Landscape Industry Certified Horticultural Technician.
 5. Pesticide Applicator: State licensed, commercial.
- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
 1. Selection of plants shall be made by Architect, who tags plants at their place of growth before they are prepared for transplanting.
- C. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
 1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- B. Bulk Materials:
 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Accompany each delivery of bulk materials with appropriate certificates.

- C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- D. Handle planting stock by root ball.
- E. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.
- F. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
 - 1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
- G. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.
- H. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
 - 1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 2. Do not remove container-grown stock from containers before time of planting.
 - 3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.7 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.

2. Warranty Periods: From date of Substantial Completion.
 - a. Trees: 1 year.
 - b. Shrubs, Vines, Ornamental Grasses, Ground Covers, Biennials, Perennials, and Other Plants: 1 year
 - c. Sod: 1 year
 - d. Annuals: Three months.
3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Annuals: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 FERTILIZERS

- A. Trees: Ref 32 9100 "Soil Preparation" for fertilizer selection

- B. Shrub, groundcover, annuals and perennials: MicroLife all organic fertilizer as supplied by San Jacinto Environmental (713) 957-0909. Apply at mfg. max. recommended rates. Ref. Section 32 9100- "Soil Preparation"

2.3 MULCHES

- A. Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - 1. Type: Forest Fines
 - 2. Grind: 1.5" minus, ground brush and tree trimmings
 - 3. Color: Natural (Brown)
 - 4. Depth: 3"
- B. Compost: Ref 32 9100 "Soil Preparation"
- C. Rock Mulch:
 - 1. Decomposed Granite
 - a. Size: 3/8" Minus
 - b. Clean, hard, durable particles of fragments of decomposed granite, "California gold" available from Southwest Boulder & Stone, California <https://www.southwestboulder.com/> or approved equal.
 - c. Free of clay lumps, organic material, and deleterious material.

2.4 WEED-CONTROL BARRIERS

- A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids.
- B. Mirafi 140 NL as manufactured by Nicolon Mirafi Group, Pendergrass, GA, (888) 795-0808 or approved equal.

2.5 PESTICIDES

- A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.6 TREE-STABILIZATION MATERIALS

- A. Stakes and Guys:

Contractor shall use staking materials necessary to meet requirements of specifications, subject to approval:

1. Tree Stakes: 7' & 8' long steel T-post weighing 1.33 pounds per foot.
2. Paint for Stakes: Pittsburgh Paint No. 515-5 Stonehenge Greige.
3. Tie Webbing: Tree Tie Webbing by AM Leonard-Green

2.7 LANDSCAPE EDGINGS

- A. Concrete Edging: Ref. Materials Schedule
- B. Steel Edging: Ref. Materials Schedule
- C. Aluminum Edging: Ref. Materials Schedule
- D. Bender Board Edging: Ref. Materials Schedule

2.8 MISCELLANEOUS PRODUCTS

- A. Root Barrier: Black, molded, modular panels manufactured with 50 percent recycled polyethylene plastic with ultraviolet inhibitors, 85 mils thick, with vertical root deflecting ribs protruding 3/4 inch out from panel, and each panel 24 inches wide.
- B. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- C. Burlap: Non-synthetic, biodegradable.
- D. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.
- E. Planter Filter Fabric: Nonwoven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.
- F. Mycorrhizal Fungi: Dry, granular inoculants containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 4. Uniformly moisten excessively dry soil that is not workable, and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.
- E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
- F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.3 PLANTING AREA ESTABLISHMENT

- A. Loosen subgrade of planting areas to a minimum depth of 8 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
1. Apply fertilizer directly to subgrade before loosening.
 2. Thoroughly blend planting soil off-site before spreading.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 3. Spread planting soil to a depth indicated on the Drawings.

- a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- D. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at maximum application rate recommended by manufacturer.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 - 1. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
 - 2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 - 3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 - 4. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 - 5. Maintain supervision of excavations during working hours.
 - 6. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
 - 7. If drain tile is shown on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- B. Follow Soil Preparation Execution. Ref. 03 9100
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
 - 1. Hardpan Layer: Drill 6-inch- diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

- A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
 - 1. Use Blended Planting Soil for backfill. Follow Soil Preparation Specification. Ref. 329100
 - 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Follow Soil Preparation Specification. Ref. 039100 for fertilization.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Set balled and potted, and container-grown stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
 - 1. Use Blended Planting Soil for backfill. Follow Soil Preparation Specification. Ref. 329100
 - 2. Carefully remove root ball from container without damaging root ball or plant.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Follow Soil Preparation Specification. Ref. 039100 for fertilization.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.

3.6 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.
- C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

3.7 TREE STAKING

- A. Staking of trees is to be used by the Contractor, who will be responsible for material remaining plumb and straight for all given conditions through the guarantee period. Tree support shall be done as outlined on the following tables.
- B. Staking shall be completed immediately after planting. Plants shall stand plumb after staking.
- C. Stake all trees in accordance with the following table:

Tree	Stakes	Stake Size
15-45 Gal. and B&B under 3"	2	6 ft Post
65 Gal. and B&B 3"& larger	3	7 ft Post

- D. Locate first stake on prevailing windward side of tree and as close to the main trunk as is practical, avoiding root injury. Stakes shall be driven at least 18" into firm ground.
- E. Tie tree to stake using approved tree tie. Tie shall be located midway within tree crown or at a location approximately 2/3 of the overall height of the tree. Locate tie just above major side branch in order to deter slippage of tie.
- F. Locate second stake opposite first. Secure with one tie opposite upper tie at first stake.
- G. Auxiliary stem stakes shipped with trees shall be secured as above after shipping.

3.8 ROOT-BARRIER INSTALLATION

- A. Install root barrier where trees are planted within 10 feet of paving or other hardscape elements, such as walls, curbs, and walkways unless otherwise shown on Drawings. Deep Root 24-2 or approved eq.
- B. Align root barrier vertically and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.
- C. Install root barrier continuously for a distance of 60 inches in each direction from the tree trunk, for a total distance of 10 feet per tree. If trees are spaced closer, use a single continuous piece of root barrier.
 - 1. Position top of root barrier flush with finish grade.
 - 2. Overlap root barrier a minimum of 12 inches at joints.
 - 3. Do not distort or bend root barrier during construction activities.
 - 4. Do not install root barrier surrounding the root ball of tree.

3.9 GROUND COVER AND PERRENIAL PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on the Drawings
- B. Use planting soil for backfill. Follow soil preparation execution. Re. 329100
- C. Dig holes large enough to allow spreading of roots.

- D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.10 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Trees and Tree-like Shrubs in Turf Areas: As indicated on the Drawings or 3" depth
 - 2. Organic Mulch in Planting Areas: As indicated on the Drawings or 3" depth
 - 3. Mineral Mulch in Planting Areas: As indicated on the Drawings

3.11 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.
- D. Reference the Maintenance Specification 329400 for further information.

3.12 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas. Ref. 32 9100-Soil Preparation for clarifications.
- C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations. Ref. 32 9100-Soil Preparation for clarifications.

3.13 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After installation and before Substantial Completion remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.14 DISPOSAL

- A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

3.15 DECOMPOSED GRANITE/ WASHED GRANITE GRAVEL

- A. Install soil separator per manufacturer's recommendations at locations indicated in the details on the drawings.
- B. Install decomposed granite to depth and elevations indicated on the Drawings.
- C. Place decomposed granite in two lifts, 2" each lift and compact.
- G. Compact lifts to 98% SPD (standard proctor density).

END OF SECTION 32 93 00

SECTION 32 9400 - LANDSCAPE GROUNDS MAINTENANCE FOR NINETY (90) DAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS: The Drawings, Division 0 and Division 1 apply to work under this Section.

1.2 SCOPE OF WORK:

A. Work included in Base Bid:

1. Monitoring adjustment and minor repair of the landscape irrigation system.
2. Mowing, edging and trimming of lawn areas.
3. Mowing of Love Grass and Native Grass Plantings
3. Pruning and trimming of plant materials.
4. Weed, cultivating and cleaning of planting beds, turf areas, and Native grass areas..
5. General site clean up; removal of trash and products of maintenance.
6. Applications of fertilizers, ant control, insecticides and herbicides.
7. Pruning and trimming of trees.
8. Mulching trees, shrubs, groundcovers and seasonal color.
9. Extra services as needed.

B. Work Not Included in Base Bid: (Extra Service)

1. Street cleaning - other than that required as a result of maintenance operations.
2. Replacement of plant material - other than that required under the one year warranty requirement.
3. Compost amendment application
4. Aerating lawn areas.
5. Overseeding with cool-season grasses.
6. Application of pre/post emergents.
7. Additional clean-up and/or plant material replacement relating to natural weather events including hurricanes, tornadoes, severe thunderstorms, major rain events causing flooding, freezing temperatures, ice/ice storms, extended periods of draught and snow.

1.3 EXTRA SERVICES:

The intent of the ninety day maintenance period is to provide a comprehensive maintenance program to include all required services, except those services specifically excluded, to perform the work for the stated time period.

1. All services not included in the list of Base Bid items shall be considered "extra services" and will be charged for separately according to the nature of the item of work. The consent and authorization of the Owner's representative or their authorized representative must be obtained prior to the performance or installation of such "extra services" items and prior to purchase of any chargeable materials.
2. Such work may include replacement of dead plant materials other than what is already covered under the warranty period, major repairs of irrigation system, by-products of vandalism or other contracts or other site related work.
3. Application of pre/post emergents.

4. Authorized extra services work must be summarized weekly and submitted with receipts to the Owner's representative.
5. The Owner's representative is not bound by the specifications or contract to utilize the landscape maintenance contractor in the performance of "extra services" work.
6. The landscape maintenance contractor shall coordinate his activities with other contractors on the site so as to not hinder the performance of any work.
6. Authorized charges for extra work will be paid per the General Conditions of the Contract.

1.4 SUBSTITUTIONS:

- A. Specific reference to manufacturer's names and products specified in this Section are used as standards, but this implies no right to substitute other material or methods without written approval of the Owner's representative. Such permission must be secured without additional cost to Owner's representative.
- B. Installation of any approved substitution is Contractor's responsibility. Any changes required for installation of any approved substitution must be made to the satisfaction of and without additional cost to Owner's representative.

1.5 INTENT OF THE MAINTENANCE PROGRAM:

It is the intent of the maintenance program is to provide the Owner's representative with a project site that is attractive in appearance and keep all plant materials and lawns in a healthy and vigorous condition.

1.6 THE CONTRACT:

This Maintenance Contract is a period ninety days. The Contract can be terminated with cause.

1.7 CONTRACTORS PERFORMANCE:

The Contractor shall perform all work required once per week or as often as necessary to fulfill the spirit and intent of the Contract. The workmen shall be dressed in company uniforms and all required PPE (Personal Protective Equipment), and neat in appearance, perform their work in a professional manner, keep noise to a minimum and stage their work from a location on the site out of the way of the mainstream of the users. In general, the Contractor's presence on the site shall be as inconspicuous as possible.

1.8 COMMENCEMENT OF THE MAINTENANCE PERIOD:

This maintenance period shall become effective at the date of Substantial Completion.

1.9 NEGLECT AND VANDALISM:

1. Turf, shrubs, trees or plants that are damaged or killed due to contractors operations, negligence or chemicals shall be replaced at no expense to the Owner's representative. If plant damage or death is caused by conditions beyond the contractor's control, replacement shall be at the Owner's representative's expense.

2. Sprinklers or structures that are damaged due to the contractor's operations must be replaced by the contractor promptly. Likewise, damage to the irrigation system by others shall be corrected immediately by the contractor, at the Owner's representative's expense.
3. All water damage, either natural or man-made, resulting from contractor's neglect shall be corrected at the contractor's expense.
4. All damage to or thefts of landscaping and irrigation installations not caused or allowed by the contractor shall be corrected by the contractor at the Owner's expense upon receipt of written authorization to proceed.

1.12 EMERGENCIES:

1. The Contractor shall answer emergency or complaint calls within twelve (12) hours and corrective action shall be complete within twenty-four (24) hours.
2. The Contractor shall answer emergency calls regarding the Landscape Irrigation system failure or need of repair, and take corrective action within eight (8) hours. Such work, unless caused due to neglect on the part of the Landscape Maintenance Contractor, shall be considered "Extra Services".

1.13 JOB CONDITIONS:

- A. Contractor shall be familiar with all site conditions.

1.14 RESTRICTIONS:

- A. Do not use growth regulators or growth retardants or any chemicals that will have adverse effects on the organic fertilizers and soil conditioners utilized for this project.

PART 2 - PRODUCTS AND MACHINERY

2.1 MATERIALS:

Materials listed under this Section are expressly requested for use and does not prohibit or restrict the Contractor from providing other materials not listed in order to complete the work required herein.

1. Pre-Emergence Weed Control: Shall be Surflan A.S., Atrazine 4L or approved equal.
2. Post-Emergence Weed Control: Shall be Trimec Lawn Weed Killer, Sedge Hammer, Vantage, Image or approved equal.
3. Sufactant: Spreader Sticker shall be used with both pre and post emergence herbicides.
3. Herbicide: Shall be "Round Up", by Monsanto, St. Louis, Missouri.
4. Insecticide: Shall be "Astro Insecticide" as manufactured by FMC Corporation, Agricultural Products Group, 1735 Market Street, Philadelphia, PA 19103 (800.321.1362) or approved equal.
5. Fire Ant Control: Ortho Orthene Fire Ant Killer.

6. Compost: Made from recycled natural materials screened to 1" minus (for soil additive). On the Solvita compost maturity test score, must score a value of 5 or higher for tilling into the soil and be a minimum of 6 months old and fully composted. Supplied by Nature's Way Resources, Inc., Conroe, Texas or approved equal.
7. Fertilizer: FERTILIZERS AND NUTRIENT AMENDMENTS:
 - A. Fertilizer: MicroLife Hybrid 20-0-5, MicroLife Ultimate 6-2-4, and MicroLife Humates Plus 0-0-4 as supplied by San Jacinto Environmental Supplies, Houston, Texas or other approved equal supplier.
 - B. Contractor shall keep all empty bags with certificates intact and submit them to the Owner's representative.
 1. Submission of empty fertilizer bags is required to verify operation has been performed as specified.
 - C. Humate Soil Conditioner: Vigoro modified humate, Earthgreen Menefee Humate, Humate International AG 16-35 or approved equal.
 - D. Aerated Compost Tea: Natures Own or approved equal.
8. Tree Deep Feeding Fertilizer: Shall be Aerated Compost Tea with mycorrhizal fungi manufactured by Natures Own, MicroGrow or approved equal
9. Fungicide: Shall be "Systemic Fungicide" with Benomyl by Greenlight Products, San Antonio, Texas 78217, and/or Cleary Chemical 3336 WP "Turf and Ornamental Fungicide.
10. Fertilizer for annuals/perennials:

Nelson ColorStar Plus 19-13-6 with Fungicide

Foliar spray Maximum Blooms 3-8-3 Organic liquid color fertilizer
11. Soil Drenching Material: Shall be "Sub Due 2E", by the Agricultural Division of Ciba-Geigy Corporation, Greensboro, North Carolina 27409.
12. Mulch: Shall be equal to that already in use at the site. Shredded hardwood bark for groundcover areas.
13. Tree Stakes and Guys: Shall match those in use at the site.

2.2 MACHINERY:

Machinery requirements listed under this Section are not intended to be restrictions of specific manufacturers or models unless so stated. Specific mention of manufacturers is intended as a guide to illustrate the final product of maintenance operations desired.

1. Lawn Mowers: Shall be of the rotary type in good working order, finely tuned to protect the lawn from excessive exhaust fumes. Blades shall be sharp to reduce shredding of the cut grass blades.
2. Lawn Edgers: Shall be of a rigid or flexible blade type that will produce a fine clean edge where lawns meet walkways, pavements or curbs.
3. Fertilizer Spreaders: Cyclone type spreader or equal. No visible underlapping of applications will be permitted.
4. Deep Root Feeder: Shall be the Ross type by Ross Daniels, Incorporated, Des Moines, Iowa 50265.

5. Pruning Tools: Shall be maintained in good working order, cutting edges shall be sharp. Disinfect all tools when used for the removal of diseased limbs.

PART 3 - EXECUTION

3.1 LANDSCAPE IRRIGATION SYSTEM:

The Contractor shall monitor and program the automatic controlling devices to proceed optimum moisture levels in all planted areas.

1. Irrigation cycles shall be set to take place prior to sunrise (usually 4:00 - 5:00 am) unless otherwise instructed by the Owner's representative, except during visits of grounds maintenance personnel; during such visits the irrigation system may be operated as desired by those personnel.
2. Do not program controllers operating on the same water meter to water during the same time period so as to prevent over-draft of water meters. Do not switch controller to "off" at any time, except as required for testing and for maintenance operations.
3. Complete sprinkler system servicing shall be performed as required to maintain sprinklers in correct operating condition, including all required labor. Monitor and inspect sprinklers once a month or upon request of the Owner's representative. This check shall include visual "inspection" of all accessible components of the irrigation system including but not limited to controllers, remote control valves, quick couplers and heads.
4. Adjust sprinklers to avoid damage to automobiles, signs and also adjust heads to keep water off the street and sidewalks. Make repairs and alterations to the sprinkling system and water lines. All sprinklers repairs such as cleaning of heads or breaks caused by the Contractor shall be the Contractor's responsibility.
5. Minor repairs: Contractor shall make necessary repairs under \$300.00 without Owner's representative's approval to maintain operation of the system.
6. Replacement materials throughout the system shall be as specified in Section 02810.

3.2 TREES MAINTENANCE:

- A. Contractor shall maintain staking and guying of trees at all times and shall be responsible for any damage to trees or plant materials caused by chafing or breakage of foliage or limbs coming in contact with stakes or ties. Replace broken plant stakes and ties and bent stakes as needed. If ties are too tight, they must be replaced or adjusted. If stakes are not needed, remove.
- B. Trees that may require guys, stakes or special care during the winter winds and rains shall receive the required care prior to the time of rains and high winds to insure that no damage results to the plant material.
- C. All suckers shall be continually removed from trees.

3.3 SEASONAL AND PERENNIAL FLOWERS:

- A. The maintenance contractor shall continually maintain seasonal flower beds in all contract areas.

- B. Complete weeding, trimming, edging, and cultivation of all flower beds as required to keep the beds free of weeds, to promote growth and maintain neat, orderly appearance. As flowers cover open soil, cultivating shall be discontinued.
- C. Maintenance shall include:
 - 1. Pinching of blooms and pruning of dead or damaged foliage.
 - 2. Fertilize in alternate months with organic fertilizer. (RE: PART 2)
 - 3. Apply supplemental organic fertilizer to keep each type of seasonal flower performing at its optimum level.
 - 4. Spraying or dusting for disease or insect control as a preventive or corrective measure.
 - 5. Seasonal Color Change out: seasonal color change out after the initial planting (Extra Service) by the installing contractor.
- D. Fertilizer for annuals/perennials: Add ColorStar Plus 19-13-6 with Fungicide at the manufacturers recommended rate and feeding schedule. Foliar spray Maximum Blooms 3-8-3 Organic liquid color fertilizer (6 ounces per 1000 sq ft) & Garlic Oil (1 ounce per 1000 sq ft) mixed together with water and sprayed every 30 days.

3.4 HEDGE MAINTENANCE:

- A. Edge, weed, fertilize and cultivate all hedge beds in accordance with Schedule.
- B. Pruning of shrubs should create a uniformly dense plant, trapezoid in shape. Height as approved by Owner's representative. Selectively thin and tip back annually. Prune to enhance natural branching effect of plants. Do not change shape of shrubs by pruning.

3.5 GROUNDCOVER BEDS:

- A. Complete weeding, trimming, edging, and cultivating of all groundcover as required to keep the beds free of weeds, to promote growth and maintain neat, orderly appearance. As groundcovers cover open soil, cultivating shall be discontinued.
- B. Groundcover beds bordering on paved surfaces must be edged as needed to retain a neat edge. Do not trim vertically so as to expose stems and thatch.
- C. Fertilize all groundcovers with complete commercial fertilizer four times per year. (Extra Service)
- D. Replant all damaged or thin areas in groundcover beds at direction of the Owner's representative, at proper spacing.
- E. Slopes of 2:1 ratio, or steeper, shall not be cultivated due to erosion nuisance, unless otherwise instructed to cultivate by the Owner's representative.

3.6 TURF MAINTENANCE:

- A. Mowing: During periods of mild weather, mow at one and one-half (1 1/2") inches but during hot weather, the cut should be not lower than two (2") inches from the soil. Regular weekly mowing is required. Never scalp the lawn or cut more than one half the existing top growth in one mowing.

Remove or catch the clippings, never allowing clippings to remain on lawn surface more than four (4) hours.

Allow grass to grow up to but not over sprinkler heads. Trim grass around heads with a circular sprinkler head trimmer. DO NOT USE LINE TRIM AROUND SPRINKLER HEADS.

- B. Watering: Provide a regular, deep watering program. The established turf should not be kept wet but should dry out somewhat between waterings. A twice weekly watering is good under regular conditions, but if it is hot or windy, water more often. In very hot weather, a fast watering with fine spray will cool the turf zone and can supplement the regular, deeper watering program. In shaded areas caused by trees or shrubs, water more frequently because of the competition for soil moisture. If lawn wilts (shows grey-brown) water more frequently.

- C. Lawn Fertilizer: Analysis based upon soil sample.

March 1	MicroLife Hybrid 20-0-5 applied at manufacturer's maximum recommended rate.
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May 25	MicroLife Humates Plus 0-0-4 at manufacturer's maximum recommended rate.
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July 18	Same as the March application.
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October 11	MicroLife (6-2-4) at manufacturer's maximum recommended rate.
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- D. Weed Control: Contractor shall use extreme care in the use of chemicals for weed control. Before such applications are made, the turf should be well established and in a vigorous condition. Broadleaf weeds such as malva, dandelion and plantain can be controlled with applications of selective and recommended herbicides. Always follow label directions fully and carefully; wash sprayer carefully after using herbicides.

- E. Insects: Control insects with regular applications of commercial insecticides at the manufacturer's recommended rate. Spray for insects once a month from mid-spring through summer as a preventative measure.

- F. Diseases: When they first appear, spray for diseases with an approved commercial fungicide strictly according to the manufacturer's recommendations.

3.7 NATIVE GRASSES MAINTENANCE

- A. Native grass mixes – Twice annually on or about June 1st and January 1st
B. Above grasses shall be mowed to a 6" height.

3.8 CONTROL OF NOXIOUS WEEDS (Johnson Grass, Nut Grass, Poison Ivy, and other Noxious Weeds.)

- A. Noxious weeds shall be killed by using "Round Up" or other spray as approved by Owner's representative. Spray only foliage of grass to be eradicated, as this spray will kill any plant that it contacts.
- B. Irrigation to sprayed area should remain "off" for a period of three days following spray application. Repeat spray as required to kill completely.
- C. Apply pre/post-emergent weed killer as per manufacturer's recommendation as required by the "Schedule" and approved by Client prior to application.
- C. Weeds 30" or taller shall be removed/eradicated in Native Grass zones.

3.9 USE OF HERBICIDES, INSECTICIDES, AND STERILANTS:

- A. The Contractor is hereby granted permission to use such herbicides, insecticides, and sterilants as it may find necessary and advantageous in its grounds maintenance activities. Herbicides, insecticides, and sterilants, must be used responsibly and in conformance with Federal, State, and Local laws and regulations. The Contractor assumes all liability for damage and/or injury resulting from accident or misuse of these products and/or equipment. The Owner's representative retains the right to prohibit the use of any herbicide, insecticide, and sterilant that he may judge to be undesirable for any reason.
- B. Products leaving an undesirable residue or odor (i.e., weed oil) shall not be used.
- C. The Owner's representative shall be notified prior to application and advised of any danger associated with the use of these products (i.e., to avoid personal contact with sprayed areas, etc.).
- D. Apply insecticides as needed to protect all plant materials from damage. The insect control program shall include slugs and snails and advance preventive spraying for twig borers. The Contractor shall be responsible for the choosing of chemicals and insecticides he uses and shall be accountable for any misuse of same.
- E. Apply the proper fungicide, herbicide and pesticides for the control of pests, weeds and plant diseases or treat cuts on exposed surfaces of trees or shrubs for disease and pest control on turf, plants and trees.

3.10 GENERAL CLEAN UP:

- A. The Contractor shall dispose of all waste materials or refuse from his operations legally off the property except where agreement is reached with the Owner's representative.
- B. All plant growth shall be prevented in any cracks in walks or within paved areas.
- C. Leaves, papers, grass clippings or other debris shall be removed at least weekly or at each visit from all areas.
- D. Trash receptacles shall be checked regularly and emptied, and trash removed from the site frequently enough so that trash never overflows the receptacles. Trash receptacles shall be lined with black plastic bags which shall be emptied and removed from the site daily.

PART 4.00 - SCHEDULE

4.1 SCHEDULE:

The Schedule as included herein shall govern the work. Should the Contractor require an alteration of the Schedule, contact the Owner's representative.

JANUARY: WEEKS 1, 2, 3, 4

TURF

The turf shall be watered as needed. Turf shall be raked during the latter part of the month, to remove thatch. Mow turf for the first time in week 4.

TREES, SHRUBS, AND VINES

Trees shall be pruned except flowering trees and flowering shrubs which shall be pruned after flowering. Do not change shape of tree, prune to enhance shape. Pre-emergent herbicides shall be applied if approved by Client. Weed beds as required.

FEBRUARY: WEEKS 1, 2, 3, 4

TURF

The turf shall be watered as needed. Turf shall be raked during the latter part of the month, to remove thatch. Mow turf weeks 2 and 4.

TREES, SHRUBS, AND VINES

Continue pruning trees. Apply tree fertilizer to established trees. Deep root feeding is method to use during this period. Iron and other elements shall be applied if needed. Fertilize acid loving plants as called out under "Material Used". Do not fertilize flowering shrubs until blooming is completed.

MARCH: WEEKS 1,2

TURF

Turf shall be mowed in week two. Mowing shall not remove more than one-quarter (1/4") inch off existing height. First application of fertilizer (Microlife Hybrid 20-0-5) shall be applied at manufacturer's maximum recommended rate. Water thoroughly after applying fertilizer. Mow first; then fertilize.

TREES, SHRUBS, AND VINES

Check Plants for adequate watering to prevent any winter damage. Water if necessary. Prune dead wood as required. Continue to weed beds.

Mulch shall be placed in all beds, a two (2") inch to three (3") inch layer over existing mulch if mulch is not adequate. Dead vines should be removed. Flowering plants should be fertilized only after blooming.

MARCH: WEEKS 3, 4

TURF

Mow as required; still only one-quarter (1/4") inch off existing growth. Water as required. Weed control should be continued. Replace any winter damaged sod at this time.

TREES, SHRUBS, AND VINES

Inspect evergreens for insects and diseases, spray as required. Spray for borers. Continue to weed beds. Fertilize trees and flowering shrubs if they have buds.

Application should be 10-8-4 at a rate of ten (10) pounds per 1,000 square feet. Acid loving plants should be given special attention as called out in "Material Used".

APRIL: WEEKS 1, 2, 3, 4

TURF

Mowing should be continued; begin cutting one and one-half (1 1/2") inches to two (2") inches above grade. Water as required.

TREES, SHRUBS, AND VINES

Flowering plants should be through flowering and ready to be pruned and fertilized, if not already completed. Prune remaining dead wood from trees, shrubs, and vines, retaining natural shape. Continually remove all suckers on base of trees.

MAY: WEEKS 1, 2

TURF

Mowing shall continue once a week. During this period, it is important to note the soil moisture. Grasses may have been actively growing for about two and one-half (2 1/2) months, and need to be watered thoroughly.

TREES, SHRUBS, AND VINES

Inspect evergreens for mites and borers and spray as required. Inspect plants for scale insects and spray as required. Inspect flowering trees for powdery mildew and apply fungicide as required. Apply herbicide to shrub beds as required, using the same materials as in early spring. Weed beds as required. Water established trees at a rate of two (2") inches per week.

MAY: WEEKS 3, 4

TURF

Mow as required. Second application of fertilizer (Microlife Humates 0-0-4) shall be applied at manufacturer's maximum recommended rate. Water thoroughly after applying fertilizer. Mow first; then fertilize. Particular attention shall be directed to the amount of water applied to turf.

TREES, SHRUBS, AND VINES

Continue to check plants for pests and control as required. Water any established plants as needed. Pruning shall cease until Fall. Apply fertilizer to acid loving plants again.

JUNE: WEEKS 1, 2, 3, 4

Mulching trees, shrubs, groundcovers and seasonal color.

NATIVE GRASSES

Native grasses and love grass shall be mowed.

TURF

Mowing shall continue once per week. As the temperature rises, the mower should be raised one-half (1/2") inch to one (1") inch higher to maintain a good thick stand of grass. Inspect lawn for disease and inspect pests; apply fungicide only if necessary. Be alert for brown patch, Bermuda decline and chinch bugs in Bermuda sod. Watch Bermuda for bare spots and underwatered areas.

TREES, SHRUBS, AND VINES

Maintain adequate moisture for newly planted trees, shrubs, and vines. Water any established plants as needed. Do not fertilize any wood plants until cooler weather. Continue to check plants for pests and control as required. Weed beds as required.

JULY: WEEKS 1, 2, 3, 4

TURF

Mow weekly, maintain previous months height. Avoid watering in the middle of the day. Check turf for disease again, especially chinch bugs. Third application of fertilizer (Microlife Hybrid 20-0-5) should be applied at manufacturer's maximum recommended rate. Apply recommended controls as necessary.

TREES, SHRUBS, AND VINES

Maintain adequate moisture for newly planted trees, shrubs, and vines. Water any established plants as needed. Do not fertilize any woody plants until cooler weather. Continue to check plants for pests and control as required. Weed beds as required.

AUGUST: WEEKS 1, 2, 3, 4

TURF

Mow weekly. Continue to irrigate as needed to keep turf from being stressed by lack of water. Inspect lawn for diseases. Apply necessary chemicals if needed; use caution.

TREES, SHRUBS, AND VINES

Continue to check trees, shrubs, and vines for adequate moisture around rootballs. No pruning shall be done during this period. Check all trees, shrubs, and vines for possible disease and insects, spray if necessary. Second application of fertilizer should be spread at manufacturer's maximum recommended rate.

SEPTEMBER: WEEKS 1, 2

TURF

Mow weekly. At this time lower mower to one and one-quarter (1 1/4") inches to one and one-half (1 1/2") inches. Irrigate as needed.

TREES, SHRUBS, AND VINES

Maintain adequate moisture for newly planted trees, shrubs, and vines. Water any established plants as needed. Root feed trees again. Acid type fertilizer and iron should be applied to trees, shrubs, and vines.

SEPTEMBER: WEEKS 3, 4

TURF

Mow weekly. Watch turf for diseases, apply chemicals as required.

TREES, SHRUBS, AND VINES

Maintain adequate soil moisture for all trees, shrubs, and vines. Prune only if necessary. Continue to check for any pests or disease, apply chemicals as required.

OCTOBER: WEEKS 1, 2, 3, 4

TURF

Mow weeks 1, 2 and 4. Watering can be reduced at this time. Continue to check for diseases. Fourth application of fertilizer (MicroLife 6-2-4) shall be applied at manufacturer's maximum recommended rate. Mow first; then fertilize. Water thoroughly after applying fertilizer. Turf should be thick and healthy for winter months. Overseed with annual rye grass at the rate of four (4) pounds per 1,000 square feet (only if requested by the Owner).

TREES, SHRUBS, AND VINES

Check trees for proper fertilization. Apply necessary elements, if inadequate. Pruning can be started lightly at this time. Weed beds as required. A two (2") inch layer of mulch shall be added on top of existing mulch.

NOVEMBER: WEEKS 1, 2, 3, 4

TURF

Mow weeks 2 and 4. Water less at this time.

TREES, SHRUBS, AND VINES

Examine plants for pests and spray as required. Do not use pesticides unless necessary. Weed beds as required.

DECEMBER: WEEKS 1, 2, 3, 4

NATIVE GRASSES

Native grasses and love grass shall be mowed.

TURF

Last mowing shall be performed during first 2nd week of month. Rake leaves as required.

TREES, SHRUBS, AND VINES

Remove leaves from beds. Weed beds as required. Check plants for diseases, spray as required.

END OF SECTION

33 11 00 SITE WATER DISTRIBUTION UTILITIES

Part 1 – General

A. Related Sections

1. 31 20 00: Earthwork: Excavation, Filling and Grading
2. 32 11 23: Aggregate Base
3. 32 13 15: Site Concrete Improvements

B. Reference Standards

1. Conform to Section 207 of the Standard Specifications for Public Works Construction.

Part 2 – Products

A. Water Pipe

1. 1" Water lines shall be Copper Pipe that is seamless copper water tubing conforming to ASTM B88, Type L, annealed furnished from 60' – 100' coils.
2. Joints for all copper water tubing (2 ½" O.D. and smaller) shall be jointed with appropriate solder type wrought copper fittings

B. Fire Hydrants

1. Hydrants shall be wet barrel type conforming to AWWA C503
2. Hydrants shall be Mueller A-480 E, LB Ironworks #702, James Jones #J3700 Fluted Barrel, or Clow #550.

C. Mechanical Thrust Restraint

1. Restraint shall be incorporated into the follower gland.
2. Gland shall be ductile iron conforming to ASTM A 536.
3. Restraining device shall be provided with pressure rating equal to that of the pipe on which it is installed.
4. Mechanical thrust restraint devices shall be EBAA Iron Megalug, or Approved equal.

D. Tracer Wire

1. Tracer wire for nonmetallic pipe shall be electrically continuous #14 copper or aluminum tracer wire, Type TW blue plastic covered for domestic water and red for fire sprinkler.

E. Water Service Line Materials

1. Copper tubing shall be Type L and conform to ASTM B 88.
2. Fittings for solder type joints shall conform to ANSI B16.18. Fittings for compression type joints shall conform to ASME B16.26 flared tube type.

3. Corporation stops shall be ground key type manufactured of bronze conforming to ASTM B61.
4. Goosenecks shall be type K Copper tubing.
5. Gate valves 3-inches and smaller shall be MSS SP-80, Class 150 solid wedge and non- rising. Valves shall be provided with flange end connections or threaded end connections with union on one side of valve. Provide direct burial handles for underground valves, do not use spline stems.

F. Water Meter

1. Water meter indicated on Drawings will be installed by water purveyor for the area unless noted otherwise.
2. Provide a second meter for irrigation water.

G. Back flow Preventer Assemblies

1. Assembly shall be provided with flanged connections, galvanized cast iron or epoxy coated construction
2. Double detector backflow preventer assembly shall consist of two independently acting spring loaded toggle lever check valves, 2 shut off valves and 4 test cocks.
3. Backflow assembly shall meet AWWA Standard C510.
4. Backflow preventer devices shall be tested and certified by the water agency having jurisdiction.

H. Bedding and Backfill

1. It is acceptable to use native soil as backfill in accordance with the details in the drawings and the requirements of the geotechnical report.

Part 3 – Execution

A. Pipe Installation

1. Install pipe in conformance with Section 306 of the Standard specifications for Public Works Construction
2. Before trench excavation, verify point of connection, pipe depth, invert elevation, and material.
3. Install bell and spigot pipe with bell end pointing in the direction of flow.
4. Provide tracer wire for non-metallic pipes. Fasten to top of pipe at 20-foot intervals.

B. Fire Hydrant Installation

1. Install hydrants according to the requirements of AWWA C600 for hydrant installation
2. Install hydrant with 6-inch RW gate valve at least 4-feet and no more than 10-feet from hydrant

3. Provide metal guard posts in areas of vehicle traffic and not protected by raised curbing.
- C. Clearances
1. Water pipe shall be placed a minimum of 5-feet from building walls.
 2. Water line shall be separated from the sewer line in accordance with the requirements of the State of California Department of Health Services.
 3. Water line shall be installed 1-foot minimum above sewer line crossings.
- D. Testing
1. Pressure test pipelines per Local Agency standards and AWWA C600. No leakage is permitted.
- E. Disinfection of Domestic Water Line
1. When piping has been installed and tested, sterilize system before use and substantial completion in accordance with Local Agency Standards.

33 30 00 SITE SANITARY SEWER SYSTEMS

Part 1 – General

A. Related Sections

1. 31 20 00: Earthwork: Excavation, Filling and Grading
2. 32 11 23: Aggregate Base
3. 32 13 15: Site Concrete Improvements

B. Reference Standards

1. Conform to Section 207 and 208 of the Standard Specifications for Public Works Construction
2. Conform to NCPI Requirements
3. Conform to State of California Department of Health Services.

Part 2 – Products

A. Sewer Pipe: PVC pipe shall conform to SDR 35.

B. Concrete: Conform to Section 201 of the Standard Specifications for Public Works Construction

C. Metal Grates, Covers Frames and Accessories: traffic rated (H-20 loading).

D. Bedding and Backfill

1. Pipe shall be installed on a minimum 6-inch sand bedding, above and below pipe, and backfilled.
2. Slurry backfill within public roadway sections is required per the local jurisdiction. It is acceptable to use native soil as backfill in accordance with the details in the drawings and the requirements of the geotechnical report

E. Manhole Mortar and Grout: Install without steps.

F. Clean-out Assemblies

1. Clean-out assemblies shall be embossed with "SEWER" on cover.
2. Cleanout assemblies shall be Eisel Enterprises Precast Concrete Products 3L Series with cast iron locking cover.

Part 3 – Execution

A. Installation

1. Jetting of backfill will not be allowed for consolidation of trench. Water shall be added to assist with trench compaction to obtain 90 percent relative compaction.
2. Before trench excavation, verify point of connection, depth, invert elevation, and material.

3. Construct pipe slope at 2 percent minimum unless invert elevations are indicated.
4. Install cleanout assemblies at 100-foot minimum spacing and at angle points.

B. Clearances

1. Sewer pipe shall be placed a minimum of 5-feet from building walls.
2. Sewer pipe shall not be placed in same trench as water line.
3. Project site sanitary sewer receiving more than one building sanitary sewer shall be separated from the water line in accordance with the requirements of the State of California Department of Health Services.
4. Sewer shall be installed 1-foot minimum below water line crossings.

C. Testing

1. After installation, test pipeline between successive manholes for infiltration or exfiltration in accordance with Section 306- of the Standard Specifications for Public Works Construction.

SECTION 33 42 11 - STORMWATER GRAVITY PIPING AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Stormwater drainage piping.
- B. Stormwater pipe drains and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 31 23 33 – Trench Excavation and Backfill

1.3 PRICE AND PAYMENT PROCEDURES

- A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.
- B. Pipe and Fittings:
 - 1. Basis of Measurement: By the linear foot
- C. Drain Inlets:
 - 1. Basis of Measurement: By each

1.4 REFERENCE STANDARDS

- A. ASTM F714 – Standard Specification for Polyethylene (PE) Plastic Pipe
- B. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.6 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating pipe material, pipe dimensions, pipe accessories, and other necessary pipe material information.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- E. Project Record Documents:
 - 1. Record location of pipe runs, connections, and invert elevations.
 - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 PRODUCTS

2.1 STORMWATER PIPE MATERIALS

- A. Provide products that comply with applicable code(s).
- B. Plastic Pipe: ASTM D3350, High Density Polyethylene (HDPE) solid wall pipe; nominal diameter of 6-inch.
- C. Thermal butt fusion for joining pipe or flanged joint connection as stated in S.S.P.W.C. Section 209-5 'High-Density Polyethylene (HDPE) Solid Wall Pressure Pipe.'

2.2 PIPE ACCESSORIES

- A. 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.
- B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Stormwater Service" in large letters.

2.3 INLET MATERIALS

- A. Storm Drain inlet materials and composition of grate shall be ADA compliant and be able to support 'Class A' Loads (1 – 60 psi) which is recommended for pedestrian, bicycle and wheelchair traffic.
- B. Storm Drain inlet material shall be compatible with proposed 6" HDPE Storm Drain pipe.
- C. Storm Drain inlet material shall be Foam Polyolefin or approved equal.

2.4 BEDDING AND COVER MATERIALS

- A. Bedding: As specified in Section 31 23 33 and as shown on Contract Plans.
- B. Cover: As specified in Section 31 23 33 and as shown on Contract Plans.

PART 3 EXECUTION

3.1 TRENCHING

- A. See Section 31 23 33 - Trenching for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.2 INSTALLATION

- A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
- 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 system.
- D. Install continuous trace wire 6 inches (150 mm) above top of pipe.

3.3 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 42 11